

AP PGECET 2025 Food Technology Question Paper with Solution

Time Allowed :3 Hours	Maximum Marks :120	Total Questions :120
-----------------------	--------------------	----------------------

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The duration of the test is **3 hours**.
2. Each question carries **1 mark**. There is **no negative marking**.
3. The medium of the question paper is **English** and **Telugu/Urdu** (as opted by the candidate).
4. Candidates must report at the test center **at least 90 minutes before** the commencement of the examination.
5. Candidates must carry:
 - **Filled-in Online Application Form (printout)**
 - **Valid Photo ID Proof** (Aadhaar, Passport, PAN, Driving Licence, etc.)
6. Rough work must be done only on the provided rough sheets. Additional sheets will not be provided.
7. Use of **calculators, mobile phones, smart watches, or any electronic devices** is strictly prohibited.
8. Follow the invigilator's instructions carefully. Any malpractice will result in **disqualification**.

1. Which of the following is an essential fatty acid that must be obtained from the diet?

- (A) Stearic acid
- (B) Oleic acid
- (C) Linoleic acid
- (D) Palmitic acid

Correct Answer: (C) Linoleic acid

Solution:

An essential fatty acid is one that the body cannot synthesize on its own and must be acquired through diet.

Stearic acid and palmitic acid are saturated fatty acids, which are non-essential as the body can produce them.

Oleic acid is a monounsaturated fatty acid that is also non-essential.

Linoleic acid is a polyunsaturated omega-6 fatty acid that the human body cannot create from other substances.

Therefore, linoleic acid is an essential fatty acid.

Quick Tip

Remember the two key essential fatty acids: Linoleic Acid (LA), an omega-6, and Alpha-Linolenic Acid (ALA), an omega-3. All other fatty acids can be synthesized by the body if these two are present in the diet.

2. Which mineral is essential for hemoglobin formation and the prevention of anemia?

- (A) Calcium
- (B) Iron
- (C) Iodine
- (D) Sodium

Correct Answer: (B) Iron

Solution:

Hemoglobin is the iron-containing protein in red blood cells that is responsible for transporting oxygen.

The core of the hemoglobin molecule's heme group is a single atom of iron (Fe).

This iron atom is what reversibly binds to oxygen, making it indispensable for oxygen transport.

A deficiency in dietary iron impairs hemoglobin synthesis, leading to iron-deficiency anemia.

Calcium is for bones, iodine for thyroid function, and sodium for fluid balance.

Quick Tip

Associate key minerals with their primary function: Iron with blood and oxygen (hemoglobin), Calcium with bones and teeth, Iodine with the thyroid gland, and Sodium with nerve function and fluid balance.

3. Which mineral is required for the synthesis of thyroid hormones and prevents goiter?

- (A) Zinc
- (B) Iron
- (C) Iodine
- (D) Selenium

Correct Answer: (C) Iodine

Solution:

The thyroid gland produces hormones like thyroxine (T4) that regulate metabolism.

Iodine is an essential and integral component of these thyroid hormones.

If iodine intake is insufficient, the thyroid cannot produce enough hormones.

In response, the thyroid gland enlarges in an attempt to capture more iodine, causing a swelling known as a goiter.

Therefore, adequate iodine intake is necessary for thyroid hormone synthesis and goiter prevention.

Quick Tip

In nutritional science, the term "goiter" is almost exclusively linked to iodine deficiency. The fortification of table salt with iodine is a common public health measure to prevent this condition.

4. The green color of leafy vegetables is due to the pigment:

- (A) Chlorophyll
- (B) Carotene
- (C) Lycopene
- (D) Anthocyanin

Correct Answer: (A) Chlorophyll

Solution:

Pigments are substances that absorb specific wavelengths of light.

Chlorophyll, the pigment essential for photosynthesis, absorbs red and blue light strongly but reflects green light.

This reflection of green light is what gives plants and leafy vegetables their characteristic green appearance.

Carotene imparts an orange color, lycopene a red color, and anthocyanin a red, purple, or blue color.

Hence, the green color is specifically attributed to chlorophyll.

Quick Tip

Associate colors with common food pigments: Green → Chlorophyll. Orange/Yellow → Carotenoids (like carotene). Red → Lycopene/Anthocyanins. Blue/Purple → Anthocyanins.

5. Monosodium glutamate (MSG) is used in foods to enhance which taste sensation?

- (A) Bitter
- (B) Sour
- (C) Umami

(D) Astringency

Correct Answer: (C) Umami

Solution:

Umami is recognized as the fifth basic taste, alongside sweet, sour, salty, and bitter.

It is described as a savory, meaty, or brothy flavor.

Monosodium glutamate (MSG) is a food additive that is the sodium salt of glutamic acid.

MSG functions as a flavor enhancer by directly stimulating the umami receptors on the tongue.

This enhances the overall savory profile of the food.

Quick Tip

Umami is the "fifth taste." When you see a question about MSG or savory flavor enhancement, the answer is almost always umami. Natural sources of umami include Parmesan cheese, mushrooms, and soy sauce.

6. Enzymatic browning in cut apples is primarily caused by which enzyme?

(A) Amylase

(B) Polyphenol oxidase

(C) Protease

(D) Lipase

Correct Answer: (B) Polyphenol oxidase

Solution:

When an apple is cut, its cells are damaged, exposing their internal contents to oxygen in the air.

The apple tissue contains an enzyme called polyphenol oxidase (PPO).

In the presence of oxygen, PPO catalyzes the oxidation of phenolic compounds present in the apple.

This reaction produces quinones, which then polymerize to form dark-colored pigments (melanins), causing the cut surface to turn brown.

Amylase, protease, and lipase are digestive enzymes that break down starches, proteins, and fats, respectively.

Quick Tip

Remember the three components needed for enzymatic browning: an enzyme (Polyphenol Oxidase), a substrate (phenolic compounds), and oxygen. Removing or inactivating any of these (e.g., by adding lemon juice or blanching) can prevent browning.

7. Which of the following nutrients should contribute the most calories in a balanced diet?

- (A) Proteins
- (B) Fats
- (C) Carbohydrates
- (D) Vitamins

Correct Answer: (C) Carbohydrates

Solution:

A balanced diet requires energy from macronutrients: carbohydrates, proteins, and fats.

General dietary guidelines, such as the Acceptable Macronutrient Distribution Ranges (AMDRs), provide recommendations for caloric intake.

The AMDR for carbohydrates is 45-65% of total daily calories.

The AMDR for fats is 20-35%, and for proteins is 10-35%.

Vitamins are micronutrients and do not provide calories.

Based on these ranges, carbohydrates should be the largest source of calories in a healthy, balanced diet.

Quick Tip

Recall the caloric values per gram: Carbohydrates = 4 kcal/g, Proteins = 4 kcal/g, Fats = 9 kcal/g. While fats are the most calorie-dense, dietary guidelines recommend carbohydrates as the largest percentage of total daily caloric intake.

8. During the bacterial growth curve, the phase in which bacteria multiply at the fastest rate is the:

- (A) Lag phase
- (B) Exponential (log) phase
- (C) Stationary phase
- (D) Death phase

Correct Answer: (B) Exponential (log) phase

Solution:

The bacterial growth curve describes the four phases of growth in a closed system.

The Lag phase is a period of adaptation with no significant increase in cell number.

The Exponential (or log) phase is characterized by rapid, exponential cell division as conditions are optimal. This is when the growth rate is maximal.

The Stationary phase occurs when nutrient depletion or waste accumulation slows growth; the rate of cell division equals the rate of cell death.

The Death phase is when the death rate exceeds the division rate, leading to a population decline.

Thus, the fastest multiplication occurs in the exponential (log) phase.

Quick Tip

Visualize the bacterial growth curve. The "log phase" is the steep, upward-sloping part of the curve, representing exponential growth. This is the period of most rapid multiplication.

9. Botulism, a severe form of food poisoning, is caused by a toxin produced by:

- (A) *Staphylococcus aureus*
- (B) *Clostridium botulinum*
- (C) *Salmonella botulinum*
- (D) *Escherichia coli*

Correct Answer: (B) *Clostridium botulinum*

Solution:

Botulism is a serious illness caused by the botulinum neurotoxin.

This toxin is produced by the bacterium *Clostridium botulinum*.

C. botulinum is an anaerobic (thrives in low-oxygen conditions) and spore-forming bacterium.

It poses a significant risk in improperly canned or preserved foods, where the anaerobic environment allows its spores to germinate and produce the deadly toxin.

The other bacteria listed cause different foodborne illnesses, but not botulism. "*Salmonella botulinum*" is not a valid bacterial name.

Quick Tip

Associate *Clostridium botulinum* with two key features: it produces a deadly neurotoxin (botulism) and it thrives in anaerobic (oxygen-free) environments, making it a major concern for improperly canned foods.

10. Yogurt is produced by the fermentation of milk using:

- (A) *Saccharomyces cerevisiae*
- (B) *Acetobacter aceti*
- (C) *Lactobacillus bulgaricus* (with *Streptococcus thermophilus*)
- (D) *Penicillium roqueforti*

Correct Answer: (C) *Lactobacillus bulgaricus* (with *Streptococcus thermophilus*)

Solution:

Yogurt is a fermented milk product.

The fermentation process is carried out by a specific bacterial starter culture.

This culture typically consists of a symbiotic blend of *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus*.

These bacteria ferment the lactose in milk into lactic acid, which lowers the pH, causing the milk proteins to coagulate and form yogurt's texture.

Saccharomyces cerevisiae is a yeast for bread, *Acetobacter aceti* is a bacterium for vinegar, and *Penicillium roqueforti* is a mold for blue cheese.

Quick Tip

For yogurt, always look for the combination of *Lactobacillus* and *Streptococcus*. These two bacteria work as a team to create the typical taste and texture of yogurt.

11. Aflatoxin, a dangerous natural toxin found in moldy peanuts, is produced by:

- (A) *Aspergillus flavus*
- (B) *Clostridium perfringens*
- (C) *Lactococcus lactis*
- (D) *Rhizopus stolonifer*

Correct Answer: (A) *Aspergillus flavus*

Solution:

Aflatoxins are a type of mycotoxin (toxins produced by fungi).

They are known to be potent carcinogens and can cause acute liver damage.

These toxins are primarily produced by two species of mold: *Aspergillus flavus* and *Aspergillus parasiticus*.

These molds commonly grow on crops such as peanuts, corn, and cottonseed, especially under warm and humid conditions.

Therefore, *Aspergillus flavus* is the correct answer.

Quick Tip

Associate "Aflatoxin" with "Aspergillus flavus" and common substrates like peanuts and corn. It's one of the most well-known and dangerous mycotoxins in food safety.

12. Soy sauce is traditionally produced using a fermentation starter culture of:

- (A) *Aspergillus oryzae*
- (B) *Lactobacillus acidophilus*
- (C) *Saccharomyces cerevisiae*
- (D) *Propionibacterium shermanii*

Correct Answer: (A) *Aspergillus oryzae*

Solution:

The traditional production of soy sauce involves a crucial first stage of fermentation using a mold culture.

This mold starter is known as "koji".

The specific mold used to make koji for soy sauce is *Aspergillus oryzae*.

Aspergillus oryzae is grown on a mixture of steamed soybeans and roasted wheat, where it produces enzymes that break down proteins and starches, which is essential for the later stages

of fermentation.

The other organisms listed are used for different fermentations: *Lactobacillus* for dairy, *Saccharomyces* for bread/beer, and *Propionibacterium* for Swiss cheese.

Quick Tip

Remember the term "koji" for Japanese fermentation. The mold *Aspergillus oryzae* is the key ingredient for making koji, which is the foundation for soy sauce, miso, and sake.

13. Which of the following is used as a starter culture for cheese production (to ferment lactose into lactic acid)?

- (A) *Lactococcus lactis*
- (B) *Penicillium roqueforti*
- (C) *Acetobacter aceti*
- (D) *Rhizopus oligosporus*

Correct Answer: (A) *Lactococcus lactis*

Solution:

The primary step in most cheese production is the acidification of milk.

This is achieved by adding starter cultures of lactic acid bacteria (LAB).

These bacteria consume lactose (milk sugar) and convert it into lactic acid through fermentation.

Lactococcus lactis is one of the most important and widely used species of LAB in the dairy industry for making cheeses like cheddar and cottage cheese.

Penicillium roqueforti is a mold for ripening blue cheese, *Acetobacter aceti* produces vinegar, and *Rhizopus oligosporus* is used for making tempeh.

Quick Tip

For cheese starter cultures, think "Lactic Acid Bacteria." Look for names starting with Lacto-, such as Lactococcus or Lactobacillus. They are responsible for the initial fermentation of lactose.

14. Using a high concentration of salt or sugar helps preserve foods mainly by:

- (A) Lowering the pH significantly
- (B) Adding a sterilizing effect
- (C) Reducing the water activity
- (D) Providing a surface sanitizer

Correct Answer: (C) Reducing the water activity

Solution:

Microorganisms require available water to grow and carry out metabolic functions.

Water activity (a_w) is a measure of this available water in a food product.

Adding high concentrations of solutes like salt or sugar binds water molecules.

This binding process reduces the amount of free water available for microbes, thus lowering the water activity of the food.

When the water activity is lowered below the minimum required for microbial growth, the microorganisms cannot multiply, and the food is preserved. This process is based on osmosis.

Quick Tip

Food preservation by salt (curing) or sugar (jams) works on the same principle: lowering water activity (a_w). High solute concentration draws water out of microbial cells, inhibiting their growth.

15. Which of these bacteria forms heat-resistant spores and can survive inadequate cooking, potentially causing food poisoning?

- (A) *Bacillus cereus*
- (B) *Lactobacillus casei*
- (C) *Staphylococcus aureus*
- (D) *Vibrio cholerae*

Correct Answer: (A) *Bacillus cereus*

Solution:

Some bacteria, including species of *Bacillus* and *Clostridium*, can form endospores.

Spores are dormant, tough structures that are highly resistant to heat, chemicals, and radiation.

Bacillus cereus is a soil bacterium that can contaminate a wide range of foods, especially starchy foods like rice.

Its spores can survive normal cooking temperatures. If the cooked food is then held at an improper temperature (the "danger zone"), the spores can germinate into vegetative cells, which multiply and produce toxins that cause food poisoning.

The other bacteria listed (*Lactobacillus*, *Staphylococcus*, *Vibrio*) do not form spores.

Quick Tip

When a question mentions "heat-resistant spores" and food poisoning, the most likely culprits are *Bacillus cereus* (associated with rice) or *Clostridium perfringens* (associated with meats and gravies).

16. "Golden rice," a genetically modified variety of rice, has been engineered to be rich in:

- (A) Vitamin A
- (B) Vitamin B12
- (C) Iron
- (D) Protein

Correct Answer: (A) Vitamin A

Solution:

Golden Rice is a variety of rice (*Oryza sativa*) produced through genetic engineering.

It was developed as a public health intervention to combat Vitamin A deficiency, which is prevalent in regions where rice is a staple food.

The rice is engineered to biosynthesize beta-carotene, a precursor of Vitamin A, in the edible parts of the grain.

The beta-carotene gives the grains a characteristic yellow-orange or "golden" color.

The human body converts beta-carotene into Vitamin A.

Quick Tip

Associate "Golden Rice" directly with Vitamin A. The "golden" color comes from beta-carotene, which is the pro-vitamin A pigment that also makes carrots orange.

17. Parboiling is a processing technique commonly associated with which cereal grain?

(A) Wheat

(B) Maize

(C) Rice

(D) Oats

Correct Answer: (C) Rice

Solution:

Parboiling is a hydrothermal treatment applied to paddy (unhusked rice) before milling.

The process involves three main steps: soaking the paddy in water, steaming it, and then drying it.

This process gelatinizes the starch in the grain and forces water-soluble nutrients, particularly B vitamins and minerals from the bran layer, into the starchy endosperm.

As a result, parboiled rice retains more nutrients after milling compared to regular white rice and has a firmer, less sticky texture when cooked.

Quick Tip

Parboiling is a specific process for rice (paddy). Its main benefit is nutritional: it drives vitamins from the bran into the grain before the bran is removed during milling.

18. High-Temperature-Short-Time (HTST) pasteurization of milk is typically conducted at:

- (A) 63°C for 30 minutes
- (B) 72°C for 15 seconds
- (C) 100°C for 5 minutes
- (D) 135°C for 1 second

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

Solution:

Pasteurization is a heat treatment process designed to kill pathogenic microorganisms in foods like milk.

High-Temperature-Short-Time (HTST) is the most common method of pasteurization used in the dairy industry.

The legally defined standard for HTST pasteurization of milk in many countries, including under FDA guidelines, is to heat the milk to a minimum of 72°C (161°F) and hold it continuously at that temperature for at least 15 seconds.

The option 63°C for 30 minutes describes the older Low-Temperature-Long-Time (LTLT) or batch pasteurization method. The higher temperatures describe ultra-pasteurization or UHT processing.

Quick Tip

Memorize the key pasteurization parameters for milk: LTLT (batch) is 63°C for 30 min, while HTST (continuous) is 72°C for 15 sec. These are very common numbers in food processing questions.

19. If cereal grains are stored with too high moisture content, which is a likely outcome?

- (A) Increased germination during storage
- (B) Mold growth and spoilage
- (C) Improved shelf-life
- (D) Higher protein content

Correct Answer: (B) Mold growth and spoilage

Solution:

Safe storage of cereal grains depends on keeping the moisture content below a critical level.

High moisture content creates a high water activity (a_w) environment.

This high water activity is ideal for the growth of microorganisms, especially molds (fungi).

The growth of molds leads to spoilage, loss of nutrients, off-flavors, and potentially the production of harmful mycotoxins (like aflatoxin).

Therefore, mold growth and spoilage is the most direct and serious consequence of storing grains with high moisture.

Quick Tip

For safe grain storage, the key is to keep it dry. Moisture is the enemy because it enables the growth of spoilage microorganisms, particularly molds.

20. The process of "malting" barley (for brewing or malted foods) involves:

- (A) Sprouting the barley grains to activate enzymes
- (B) Roasting the grains at high temperature
- (C) Fermenting the grains with yeast
- (D) Grinding the grains into flour

Correct Answer: (A) Sprouting the barley grains to activate enzymes

Solution:

Malting is a controlled process that prepares cereal grains, primarily barley, for use in brewing and distilling.

The process has three main stages: steeping, germination, and kilning.

During steeping, the barley is soaked in water to raise its moisture content.

During germination, the moist barley is allowed to sprout under controlled conditions. This step is crucial as it activates and synthesizes enzymes, such as α -amylase and β -amylase.

These enzymes are necessary to break down the starches and proteins in the grain into simpler, fermentable sugars and amino acids during the brewing process (mashing).

Kilning (drying) halts germination and develops flavor and color.

Quick Tip

The core purpose of malting is to "wake up" the grain's natural enzymes. Think of it as controlled sprouting (germination) to create the enzymes needed to convert starch to sugar later on.

21. Freezing foods very quickly (such as in blast freezers) is beneficial because it:

- (A) Freezes only the water, leaving food components unfrozen
- (B) Creates smaller ice crystals, preserving texture
- (C) Can sterilize the food completely
- (D) Adds a protective ice glaze to the food

Correct Answer: (B) Creates smaller ice crystals, preserving texture

Solution:

The quality of frozen food is heavily influenced by the size of the ice crystals that form.

When food is frozen slowly, water molecules have time to migrate and form large, sharp, irregular ice crystals. These large crystals can puncture and damage the cell walls of the food.

Upon thawing, this cellular damage leads to significant moisture loss (drip loss) and a mushy, poor texture.

Quick freezing, in contrast, causes numerous small ice crystals to form simultaneously and uniformly throughout the food tissue. These small crystals cause much less damage to the cell structure.

As a result, the food retains its texture, flavor, and moisture much better after thawing. Freezing does not sterilize food; it only slows microbial growth.

Quick Tip

For freezing, remember: Quick freeze = Small crystals = Less cell damage = Better quality. Slow freeze = Large crystals = More cell damage = Poor quality.

22. Using a multiple-effect evaporator in food concentrate production is mainly to:

- (A) Improve the color of the product
- (B) Increase the boiling point in each stage
- (C) Save energy by reusing heat in successive stages
- (D) Add flavors during evaporation

Correct Answer: (C) Save energy by reusing heat in successive stages

Solution:

An evaporator is used to concentrate liquid foods by boiling off water. This is an energy-intensive process.

A multiple-effect evaporator consists of a series of evaporators, or "effects".

The liquid is fed into the first effect, which is heated by steam. The water vapor generated from the boiling liquid in the first effect is then used as the heating source for the second effect.

The second effect is operated at a lower pressure, which allows the liquid to boil at a lower temperature.

This process continues through the series. By reusing the latent heat of vaporization from one effect to the next, a multiple-effect evaporator drastically reduces the total steam required compared to a single-effect evaporator, thereby saving a significant amount of energy.

Quick Tip

The key principle of a multiple-effect evaporator is energy efficiency. It reuses the vapor (steam) from one stage to heat the next stage. More "effects" means more energy savings.

23. °Brix is a measurement of a solution's:

- (A) Sugar concentration
- (B) Acidity level
- (C) Protein content
- (D) Salt content

Correct Answer: (A) Sugar concentration

Solution:

Degrees Brix (°Bx) is a unit of measurement for the total soluble solids (TSS) content of an aqueous solution.

One degree Brix is defined as 1 gram of sucrose in 100 grams of solution.

In the food industry, especially for fruit juices, wine, carbonated beverages, and jams, the soluble solids are predominantly sugars.

Therefore, °Brix is widely used as a direct and convenient approximation of the sugar concentration.

It is typically measured with a refractometer or a hydrometer.

Quick Tip

When you see °Brix (or Brix), immediately think "sugar content." It's the standard industry measure for sugar in liquid products like juice and soft drinks.

24. A common refrigerant used in large-scale food refrigeration systems (such as cold storage facilities) is:

- (A) Chlorine gas
- (B) Ammonia (NH₃)
- (C) Oxygen
- (D) Carbon dioxide snow

Correct Answer: (B) Ammonia (NH₃)

Solution:

Refrigerants are substances used in a refrigeration cycle to absorb heat from a low-temperature space and release it to a higher-temperature environment.

While Freons (CFCs, HCFCs) were common, they are being phased out due to environmental concerns.

Ammonia (designated as R-717) is a natural refrigerant that has been widely used in large-scale industrial and commercial refrigeration for over a century.

It is highly efficient thermodynamically, has a zero ozone depletion potential (ODP) and zero global warming potential (GWP), and is relatively inexpensive.

Due to these advantages, it is the refrigerant of choice for large systems like cold storage warehouses, food processing plants, and ice rinks, despite its toxicity which requires careful handling.

Quick Tip

For large, industrial refrigeration systems, ammonia (NH₃) is the classic and still most common answer due to its high efficiency and low environmental impact, even though it is toxic.

25. Which factor generally increases the efficiency of drying a food product?

- (A) Greater surface area exposed to air
- (B) Larger piece size of the food
- (C) Lower air velocity over the food
- (D) Higher humidity in the drying air

Correct Answer: (A) Greater surface area exposed to air

Solution:

The drying of food is a mass transfer process where water moves from the interior of the food to its surface and then evaporates into the surrounding air.

The rate of this process is influenced by several factors.

Increasing the surface area of the food (e.g., by slicing, dicing, or shredding) exposes more of the product to the drying air. This creates a larger interface for heat and mass transfer, significantly accelerating the rate of water removal and thus increasing drying efficiency.

Conversely, larger piece size, lower air velocity, and higher humidity would all decrease the drying rate and efficiency.

Quick Tip

To dry something faster, you need to maximize the rate of evaporation. The easiest way to do this is to increase the surface area. Think of how a spread-out wet towel dries faster than a folded one.

26. Adulteration of turmeric with metanil yellow is:

- (A) Beneficial for nutrition
- (B) Permitted under food law
- (C) Illegal and a health hazard
- (D) Used to enhance natural flavor

Correct Answer: (C) Illegal and a health hazard

Solution:

Adulteration is the act of intentionally debasing the quality of food by adding or substituting inferior substances or removing valuable ingredients.

Metanil yellow is a synthetic, non-permitted coal tar dye. It is sometimes illegally added to turmeric powder to enhance its yellow color and make it look more appealing, especially if the turmeric quality is poor.

Metanil yellow is not a food-grade colorant. It has been shown to be neurotoxic and carcinogenic in studies.

Therefore, its use in food is strictly prohibited by food safety regulations (like FSSAI in India) and is considered a serious health hazard.

Quick Tip

Remember that Metanil Yellow is a non-permitted, industrial dye. Its addition to food, particularly turmeric, is a classic example of illegal adulteration that poses significant health risks.

27. FSSAI, the national food authority in India, stands for:

- (A) Food Science Society and Institute
- (B) Food Safety and Standards Authority of India
- (C) Federation of Safe Food Associations, India
- (D) Food Sterility and Sanitation Agency of India

Correct Answer: (B) Food Safety and Standards Authority of India

Solution:

FSSAI is an autonomous statutory body established under the Food Safety and Standards Act, 2006.

It is the primary regulatory body responsible for protecting and promoting public health through the regulation and supervision of food safety in India.

The full form of the acronym FSSAI is the Food Safety and Standards Authority of India.

It consolidates various acts and orders that had previously handled food-related issues in different ministries and departments.

Quick Tip

FSSAI is the main food regulatory body in India. Knowing its full name, Food Safety and Standards Authority of India, is fundamental for any questions related to Indian food laws.

28. FSMS in food industry discussions stands for:

- (A) Food Safety Management System
- (B) Food Storage Monitoring Schedule
- (C) Federal Standard for Microbiological Safety
- (D) Food Supply Management Scheme

Correct Answer: (A) Food Safety Management System

Solution:

FSMS is a widely used acronym in the food industry.

It stands for Food Safety Management System.

An FSMS is a systematic and preventive approach to food safety that addresses biological, chemical, and physical hazards.

It encompasses the necessary programs, plans, policies, procedures, practices, and records to control these hazards and ensure that food is safe for consumption.

Well-known frameworks for FSMS include HACCP and ISO 22000.

Quick Tip

Think of FSMS (Food Safety Management System) as the overall umbrella program for ensuring food safety in a company. HACCP is a key tool within an FSMS.

29. HACCP is a system designed for:

- (A) Improving the taste of food products
- (B) Analyzing food cost and pricing
- (D) Managing inventory in food warehouses

Correct Answer: (C) Identifying and controlling potential hazards in food production

Solution:

HACCP is an acronym that stands for Hazard Analysis and Critical Control Points.

It is a systematic, preventive approach to food safety, moving away from traditional end-product testing.

The core principle of HACCP is to identify potential biological, chemical, and physical hazards at specific points within the food production process.

Once these hazards are identified, critical control points (CCPs) are established where actions can be taken to prevent, eliminate, or reduce the hazards to a safe level.

Thus, its primary design is for identifying and controlling potential food safety hazards.

Quick Tip

Break down the HACCP acronym: Hazard Analysis (find what could go wrong) and Critical Control Points (figure out the essential steps to control it). It's a proactive, not reactive, system for food safety.

30. AGMARK is a certification in India that assures the quality of:

- (A) Organic milk
- (B) Gold jewelry
- (C) Medical devices
- (D) Agricultural products

Correct Answer: (D) Agricultural products

Solution:

AGMARK is a certification mark employed on agricultural products in India.

The name AGMARK is a portmanteau of "AGricultural" and "MARKeting".

It is issued by the Directorate of Marketing and Inspection (DMI) of the Government of India.

The AGMARK seal ensures that the product conforms to a set of grade standards and quality specifications prescribed by the DMI.

It covers a wide range of products including cereals, pulses, vegetable oils, spices, and semi-processed foods.

Gold jewelry is certified by BIS (Hallmark), and medical devices have their own regulatory standards.

Quick Tip

Remember the origin of the name: AG-MARK stands for Agricultural Marketing. This directly tells you that the certification applies to agricultural products in India.

31. Monosaccharides present in stachyose:

(A) galc-galc-glc-fruc.

(B) glc-fruc-glc-glc

(C) galc-glc-fruc-glc

(D) glc-galc-glc-fruc

Correct Answer: (A) galc-galc-glc-fruc.

Solution:

Stachyose is a tetrasaccharide, which means it is composed of four simple sugar (monosaccharide) units linked together.

It is part of the raffinose family of oligosaccharides found in beans and other vegetables.

The structure of stachyose consists of two galactose units, one glucose unit, and one fructose unit.

The specific linkage order is galactose-galactose-glucose-fructose.

Using the abbreviations galc (galactose), glc (glucose), and fruc (fructose), this corresponds to the formula galc-galc-glc-fruc.

Quick Tip

Remember the raffinose family of oligosaccharides by their composition:

[noitemsep, topsep=0pt]

- Sucrose = Glucose + Fructose
- Raffinose = Galactose + Glucose + Fructose
- Stachyose = Galactose + Galactose + Glucose + Fructose

Each step up adds another galactose unit.

32. The basic difference between myoglobin and haemoglobin is:

- (A) Phytol group
- (B) Molecular weight of globin protein
- (C) Porphyrin ring
- (D) Central iron atom

Correct Answer: (B) Molecular weight of globin protein

Solution:

Both myoglobin and hemoglobin are oxygen-binding proteins containing a heme group (a porphyrin ring with a central iron atom).

The fundamental structural difference lies in their quaternary structure.

Myoglobin is a monomer, consisting of a single polypeptide (globin) chain.

Hemoglobin is a tetramer, made up of four polypeptide (globin) chains.

Because hemoglobin has four globin chains to myoglobin's one, the total molecular weight of its protein component is significantly larger (approximately four times greater).

The phytol group is part of chlorophyll, not these proteins.

Quick Tip

Think "Myo" = Muscle (stores O₂), "Hemo" = Blood (transports O₂). Key difference: Myoglobin is a monomer (1 chain), Hemoglobin is a tetramer (4 chains). Four chains are heavier than one.

33. Examples of pigments benzopyran derivatives:

- (A) Chlorophyll and hemes
- (B) Carotenoids and anthocyanins
- (C) Anthocyanins and flavonoids
- (D) Anthocyanins and hemes

Correct Answer: (C) Anthocyanins and flavonoids

Solution:

Benzopyran is a chemical structure consisting of a benzene ring fused to a pyran ring.

Flavonoids are a large class of plant pigments whose basic structure is a C6-C3-C6 skeleton, which includes the benzopyran system.

Anthocyanins, which are responsible for most of the red, purple, and blue colors in plants, are a prominent subclass of flavonoids.

Therefore, both flavonoids and anthocyanins are derivatives of benzopyran.

Chlorophyll and hemes are porphyrin derivatives, and carotenoids are tetraterpenoid derivatives, which have different core structures.

Quick Tip

Associate "flavonoids" and their colorful subgroup "anthocyanins" with the benzopyran chemical structure. These are responsible for most non-green colors in fruits and vegetables.

34. Examples of prolamins in corn and wheat:

- (A) Hordein and zein
- (B) Gliadin and hordein
- (C) Oryzenin and zein
- (D) Zein and gliadin

Correct Answer: (D) Zein and gliadin

Solution:

Prolamins are a group of plant storage proteins found in cereal grains, named for their high proline and glutamine content.

The prolamin found in corn (*Zea mays*) is called zein.

The prolamin found in wheat (*Triticum aestivum*) is called gliadin.

Hordein is the prolamin in barley (*Hordeum vulgare*).

Oryzenin is a glutelin (not a prolamin) from rice (*Oryza sativa*).

Therefore, the correct pair for corn and wheat is zein and gliadin, respectively.

Quick Tip

Match the prolamin name to the plant's scientific name: *Zea mays* (corn) → Zein. Wheat contains gluten, which is made of gliadin and glutenin. *Hordeum vulgare* (barley) → Hordein.

35. Cobalt is a constituent of which vitamin:

- (A) Vitamin D
- (B) Vitamin C
- (C) Vitamin B12
- (D) Folic acid

Correct Answer: (C) Vitamin B12

Solution:

Vitamin B12 has the chemical name cobalamin.

This name reflects its unique chemical structure among all vitamins.

At the center of the complex corrin ring structure of the Vitamin B12 molecule is a single atom of the mineral cobalt.

It is the only vitamin known to contain a metal element.

Thus, cobalt is an essential constituent of Vitamin B12.

Quick Tip

The name of Vitamin B12, "cobalamin," is a direct giveaway. The "cobal-" prefix refers to the central cobalt atom in its structure.

36. Deficiency symptoms of minerals iodine and iron:

- (A) Goitre and anaemia
- (B) Osteoporosis and osteomalacia
- (C) Anaemia and osteopenia
- (D) Goitre and night blindness.

Correct Answer: (A) Goitre and anaemia

Solution:

Iodine is a crucial component of thyroid hormones, which regulate metabolism.

A dietary deficiency of iodine leads to insufficient hormone production, causing the thyroid gland to swell, a condition known as goitre.

Iron is an essential component of hemoglobin, the protein in red blood cells that transports oxygen.

A dietary deficiency of iron results in insufficient hemoglobin, leading to a condition called iron-deficiency anaemia.

Osteoporosis is related to calcium deficiency, and night blindness is related to Vitamin A deficiency.

Quick Tip

Create simple, strong associations for mineral deficiencies: Iodine ↔ Thyroid/Goitre. Iron ↔ Hemoglobin/Anaemia. Calcium ↔ Bones/Osteoporosis. Vitamin A ↔ Vision/Night Blindness.

37. Protein efficiency ratio is not based on:

- (A) Intake of plant protein
- (B) Intake and output of food protein residues
- (C) Output of protein
- (D) Intake of animal protein

Correct Answer: (B) Intake and output of food protein residues

Solution:

Protein Efficiency Ratio (PER) is a measure of protein quality.

It is calculated as the weight gain of a test subject divided by their intake of a particular food protein ($PER = \text{Weight gain} / \text{Protein intake}$).

The method directly uses the amount of protein consumed (whether plant or animal) and the resulting growth.

It does not measure the amount of protein or nitrogen excreted (the output of protein residues).

Methods that measure both intake and output of protein/nitrogen residues are called nitrogen balance studies, used to calculate Biological Value (BV) and Net Protein Utilization (NPU).

Therefore, PER is not based on the intake and output of food protein residues.

Quick Tip

Remember the formula: $PER = \text{Weight Gain} / \text{Protein Intake}$. It's a simple measure of growth. It does not account for what comes out of the body, unlike more complex measures like Biological Value (BV).

38. Amino acid which can be converted to niacin in the body:

- (A) Phenylalanine
- (B) Tyrosine
- (C) Tryptophan
- (D) Histidine

Correct Answer: (C) Tryptophan

Solution:

Niacin, also known as Vitamin B3, is an essential nutrient.

While it can be obtained directly from food, the human body also has a metabolic pathway to synthesize it.

This synthesis pathway uses the essential amino acid tryptophan as a precursor.

The body can convert dietary tryptophan into niacin, although the conversion is not highly efficient (about 60 mg of tryptophan yields 1 mg of niacin).

No other amino acid in the given options can be converted to niacin.

Quick Tip

The essential amino acid Tryptophan is a precursor for two important molecules: the neurotransmitter serotonin and the vitamin niacin (B3).

39. Red or bloody bread results from growth of :

- (A) *Serratia marcescens*
- (B) *Bacillus licheniformis*
- (C) *Pseudomonas* species
- (D) *Endomycopsis*

Correct Answer: (A) *Serratia marcescens*

Solution:

The spoilage defect known as "red bread" or "bloody bread" is characterized by the appearance of bright red spots on starchy foods.

This distinctive coloration is caused by the bacterium *Serratia marcescens*.

This organism produces a vibrant red pigment called prodigiosin.

When *Serratia marcescens* contaminates and grows on bread, the colonies produce this pigment, giving the appearance of blood spots.

Other microbes cause different types of spoilage (e.g., ropiness by *Bacillus*, green rot by *Pseudomonas*).

Quick Tip

Associate the bacterium *Serratia marcescens* with its signature red pigment, prodigiosin. This is the classic cause of the "red bread" spoilage phenomenon.

40. Black rots in eggs are caused by:

- (A) *Serratia* species

- (B) *Proteus melanovogenes*
- (C) *Alcaligenes*
- (D) *Flavobacterium*

Correct Answer: (B) *Proteus melanovogenes*

Solution:

Bacterial spoilage in eggs can result in various types of "rots," identified by their color and odor.

Black rot is characterized by the yolk turning black and a strong putrid smell.

This type of spoilage is caused by hydrogen sulfide (H_2S) producing bacteria.

Bacteria of the *Proteus* genus, such as *Proteus melanovogenes*, are known producers of H_2S .

The H_2S gas reacts with the iron in the egg yolk to form ferrous sulfide (FeS), which is a black precipitate, causing the characteristic discoloration.

Quick Tip

For egg spoilage, connect the color to the microbe type: Black Rot ↔ *Proteus* (produces H_2S). Green Rot ↔ *Pseudomonas* (produces fluorescent pigments). Red Rot ↔ *Serratia*.

41. Barny flavour in butter is produced by:

- (A) Yeasts
- (B) Actinomycetes
- (C) Enterobacter species
- (D) *Pseudomonas*

Correct Answer: (C) Enterobacter species

Solution:

Off-flavors in dairy products like butter are often indicative of microbial contamination.

A "barny" or "cowy" flavor defect is an unclean taste that suggests poor hygiene and contamination from the farm environment.

This specific off-flavor is associated with the growth of coliform bacteria.

Enterobacter species are a type of coliform bacteria. Their metabolic byproducts can impart this undesirable barny flavor to butter.

Other microbes cause different defects: yeasts can cause fruity flavors, and Pseudomonas can cause rancidity.

Quick Tip

"Barny" flavor in dairy products points to contamination with coliform bacteria, which are indicators of poor sanitation. Enterobacter and E. coli are key examples of coliforms.

42. TA spoilage is caused by:

- (A) Clostridium perfringens
- (B) Clostridium botulinum
- (C) Clostridium nigrificans
- (D) Clostridium thermosaccharolyticum

Correct Answer: (D) Clostridium thermosaccharolyticum

Solution:

In the context of canned foods, "TA spoilage" is a specific type of spoilage.

The acronym "TA" stands for Thermophilic Anaerobe.

This spoilage is caused by thermophilic (heat-loving) bacteria that grow in anaerobic (oxygen-free) conditions inside a can that has been under-processed or improperly cooled.

Clostridium thermosaccharolyticum is a classic example of such an organism.

It ferments sugars to produce large amounts of hydrogen and carbon dioxide gas, leading to swelling ("hard swell") or bursting of the can.

Quick Tip

Decode the canning spoilage terms: TA = Thermophilic Anaerobe (gas, no acid, e.g., *C. thermosaccharolyticum*). Flat Sour = Thermophilic (acid, no gas, e.g., *Bacillus stearothermophilus*). Sulfur Stinker = Thermophilic (H_2S , e.g., *C. nigrificans*).

43. Enterohaemorrhagic E coli (EHEC) sometimes is also known as:

- (A) Enteropathogenic E coli (EPEC)
- (B) Verotoxin producing E coli (VTEC)
- (C) Entero invasive E coli (EIEC)
- (D) Entero toxigenic E coli (ETEC)

Correct Answer: (B) Verotoxin producing E coli (VTEC)

Solution:

Enterohaemorrhagic E. coli (EHEC) is a pathotype of E. coli that causes severe illness.

The primary virulence factor of EHEC is the production of one or more potent toxins.

These toxins were initially named "Verotoxins" because they are cytotoxic to a cell line used in laboratories called Vero cells.

Therefore, EHEC strains are also known as Verotoxin-producing E. coli (VTEC).

The toxins are also called Shiga-like toxins, so the bacteria are also called STEC (Shiga toxin-producing E. coli). VTEC and STEC are largely synonymous terms.

Quick Tip

The key pathogenic feature of EHEC is its toxin. This toxin is called Verotoxin or Shiga toxin. This leads to the alternative names for the bacterium: VTEC (Verotoxin-producing E. coli) or STEC (Shiga toxin-producing E. coli).

44. An example of hard cheese:

- (A) Cottage cheese
- (B) Roquefort cheese
- (C) Parmesan cheese
- (D) Cheddar cheese

Correct Answer: (D) Cheddar cheese

Solution:

Cheeses are classified by firmness, which is related to moisture content.

Cottage cheese is a very soft, fresh, unripened cheese with high moisture.

Roquefort is a semi-hard cheese, made firm by aging but still retaining significant moisture.

Parmesan is classified as an extra-hard or hard-grating cheese, with very low moisture content due to long aging.

Cheddar is a quintessential example of a hard cheese. It is firm, dense, and has a relatively low moisture content compared to soft or semi-hard varieties.

While Parmesan is also hard, Cheddar is the most common example of a standard "hard cheese" among the options.

Quick Tip

Think of cheese firmness on a spectrum: Soft (Cottage Cheese) → Semi-Hard (Roquefort) → Hard (Cheddar) → Extra-Hard (Parmesan). Cheddar is the classic example of a hard cheese.

45. The bacteria which initiate fermentation of sauerkraut is:

- (A) *Leuconostoc mesenteroides*
- (B) *E coli*

(C) *Bacillus* species

(D) *Lactobacillus plantarum*

Correct Answer: (A) *Leuconostoc mesenteroides*

Solution:

Sauerkraut production relies on a natural succession of lactic acid bacteria fermenting cabbage.

The fermentation process is initiated by the species that is most tolerant of the initial conditions (high salt, cool temperature).

Leuconostoc mesenteroides is this key initiating bacterium.

It produces lactic acid, acetic acid, and carbon dioxide. The CO₂ creates an anaerobic environment, and the acids lower the pH.

This modified environment inhibits undesirable microbes and creates ideal conditions for more acid-tolerant species, like *Lactobacillus plantarum*, to take over in the later stages of fermentation.

Quick Tip

Sauerkraut fermentation is a team effort. *Leuconostoc mesenteroides* is the "starter" that gets the process going. Later, more acid-tolerant *Lactobacillus* species "finish" the job.

46. The ratio of small fish to salt in fish sauce and paste is:

(A) 4 parts of fish and 1 part salt

(B) 3 parts of fish and 2 parts salt

(C) 3 parts of fish and 1 part salt

(D) 2 parts of fish and 2 part salt

Correct Answer: (C) 3 parts of fish and 1 part salt

Solution:

The production of traditional fermented fish products like fish sauce and fish paste depends on a high concentration of salt for preservation.

The salt inhibits spoilage microorganisms while allowing the fish's own enzymes (proteases) to break down the fish tissue, a process called autolysis.

This enzymatic action releases amino acids, which create the characteristic savory (umami) flavor.

A typical and traditional ratio used in Southeast Asia for this process is 3 parts fish to 1 part salt by weight.

This results in a final salt concentration high enough (around 25%) to ensure safety and proper fermentation.

Quick Tip

For traditional high-salt fish fermentations, a substantial amount of salt is required to control microbial growth. A 3:1 ratio of fish to salt is a common and effective formulation.

47. Dehulling is done for which oilseeds:

- (A) Sunflower
- (B) Sunflower and soybean
- (C) Soybean and groundnut
- (D) Soybean

Correct Answer: (B) Sunflower and soybean

Solution:

Dehulling is the process of removing the outer coat or hull from a seed.

In oilseed processing, this is done to increase the oil yield per unit of material processed and to improve the quality of the resulting protein meal by lowering its fiber content.

Sunflower seeds have a distinct, fibrous hull that is low in oil and is therefore removed before extraction.

Soybeans are also typically dehulled to produce high-protein soybean meal for animal feed, as the hull is high in fiber.

While groundnuts (peanuts) are also de-shelled, the combination of sunflower and soybean represents two major oilseeds where dehulling is a standard and critical industrial practice.

Quick Tip

Dehulling is generally performed on seeds where the outer hull is fibrous, low in oil, and reduces the quality of the final meal. Both sunflower seeds and soybeans fit this description perfectly.

48. Conventional pulses milling methods followed in India:

- (A) Wet milling
- (B) Steam milling
- (C) Wet and dry milling
- (D) Wet and steam milling

Correct Answer: (C) Wet and dry milling

Solution:

Milling of pulses (like lentils, chickpeas) in India aims to remove the outer husk and split the grain to produce dal.

Conventional methods are not a single-step process. They involve a combination of techniques.

”Wet” methods involve soaking the pulses in water for a period to soften the husk and loosen its attachment to the cotyledons.

”Dry” methods involve techniques like applying oil, sun drying, and using abrasive rollers to remove the loosened husk.

In practice, many traditional and commercial methods use a sequence that includes both a wetting or conditioning step and a subsequent dry milling step. Therefore, ”wet and dry milling” is the most accurate description of the overall conventional process.

Quick Tip

Pulse milling (dal making) is about loosening and removing the husk. This is often achieved by a sequence of wetting (to soften) and drying (to shrink and crack the husk), followed by mechanical abrasion. Thus, it's a "wet and dry" process.

49. In dal milling industry which of the following is used for conditioning:

- (A) Oil
- (B) Water
- (C) Red earth
- (D) Oil, water and red earth

Correct Answer: (D) Oil, water and red earth

Solution:

Conditioning in dal milling refers to the pre-treatment of pulses to make husk removal easier.

This is often a multi-stage process involving several agents.

Water is used to moisten the pulses, which helps to soften and loosen the husk.

Oil is frequently applied after a drying step; it penetrates under the husk and helps in its easy separation during the milling operation.

Red earth (a type of clay powder) is used in some traditional methods as a mild abrasive to help scour off the husk during milling and can also help in uniform drying.

Therefore, the comprehensive answer that includes all these common traditional conditioning agents is "Oil, water and red earth".

Quick Tip

Conditioning for dal milling involves a combination of treatments. Water softens the husk, oil helps it slip off, and in traditional methods, red earth acts as an abrasive to help scrub it clean.

50. Blanching of fruits and vegetables is done:

- (A) To inactivate enzymes
- (B) To reduce moisture content
- (C) To reduce volume to surface area
- (D) To prevent nutrient loss

Correct Answer: (A) To inactivate enzymes

Solution:

Blanching is a brief heat treatment, usually using hot water or steam, applied to vegetables and some fruits.

It is a critical pre-treatment step before processes like freezing, drying, or canning.

The primary purpose of blanching is to inactivate or denature naturally occurring enzymes within the plant tissues.

Enzymes such as polyphenol oxidase, peroxidase, and lipoxygenase can cause undesirable changes in color, flavor, texture, and vitamin content during storage if not inactivated.

By destroying these enzymes, blanching helps to preserve the overall quality of the processed food.

Quick Tip

The number one reason for blanching is enzyme inactivation. Think of it as "locking in" the quality (color, flavor, nutrients) of vegetables before freezing or canning by stopping the enzymes that would otherwise degrade them.

51. Which of the following step is not a part of tea processing?

- (A) Withering
- (B) Fermentation
- (C) Rolling

(D) Winnowing

Correct Answer: (D) Winnowing

Solution:

The standard manufacturing process for black tea consists of four main steps in sequence.

1. Withering: Freshly plucked leaves are spread out to wilt and reduce moisture content.
2. Rolling: The withered leaves are twisted and broken to rupture cell walls, releasing enzymes.
3. Fermentation (Oxidation): The rolled leaves are exposed to air, allowing enzymes to oxidize catechins, which develops color and flavor.
4. Drying: The leaves are heated to stop oxidation and reduce the final moisture content.

Winnowing is a process used to separate grain from its chaff, and while sorting and grading of tea leaves occur, winnowing is not considered a primary stage of tea processing itself.

Quick Tip

Remember the acronym WRFD for the main steps of black tea processing: Withering → Rolling → Fermentation (Oxidation) → Drying.

52. Wet processing of coffee bean yields:

- (A) Parchment coffee
- (B) Cherry coffee
- (C) Kerala coffee
- (D) Ivory coffee

Correct Answer: (A) Parchment coffee

Solution:

Coffee beans are the seeds inside a fruit called a coffee cherry.

Wet processing (also known as the washed method) is a technique to remove the outer layers from the bean.

In this process, the outer skin and pulp are mechanically removed, and the sticky mucilage layer is fermented off.

After washing and drying, what remains is the coffee bean enclosed in a thin, paper-like protective layer called the parchment (endocarp).

This product, the dried bean still in its parchment layer, is known as "parchment coffee".

Quick Tip

Remember the coffee processing terms: "Cherry coffee" is the whole fruit. The "wet process" removes the fruit layers but leaves the "parchment" layer on the bean. The "dry process" dries the entire cherry.

53. Clove contains:

- (A) Carveol
- (B) Indole
- (C) Clovonol
- (D) Eugenol

Correct Answer: (D) Eugenol

Solution:

Cloves are the aromatic flower buds of a tree in the family Myrtaceae.

Their characteristic strong, pungent aroma and flavor are due to the presence of an essential oil.

The main chemical component of this essential oil, comprising 70-90% of the total, is eugenol.

Eugenol is an aromatic oily liquid that is responsible for both the scent and the medicinal properties (like being a mild anesthetic) of cloves.

Quick Tip

The distinctive aroma of cloves is almost entirely due to one compound: Eugenol. This compound is so characteristic that it's also used in perfumes and as a flavoring agent in many products.

54. For smoking of meat which wood is used:

- (A) Hard wood like hickory, oak, pecan, maple.
- (B) Soft woods like pine, cedar
- (C) Sandal wood
- (D) Semi hard wood like beech

Correct Answer: (A) Hard wood like hickory, oak, pecan, maple.

Solution:

The type of wood used for smoking meat is critical for the final flavor of the product.

Hardwoods from deciduous trees are preferred because they are low in resin and burn slowly and cleanly.

This slow combustion produces a pleasant, aromatic smoke containing compounds that add desirable flavor and color to the meat. Hickory, oak, pecan, maple, and fruitwoods like apple and cherry are classic examples.

Softwoods, such as pine and cedar, contain high levels of flammable resins. When burned, these resins produce a thick, sooty smoke that imparts a bitter, acrid flavor to the food, making it inedible.

Quick Tip

A simple rule for smoking meat: Hardwood is good, softwood is bad. Softwoods contain resins that create a harsh, unpleasant smoke and ruin the food.

55. Enzyme present in papaya, pineapple and figs:

- (A) Papain, bromelin
- (B) Papain bromelin and ficin
- (C) Ficin
- (D) Papain

Correct Answer: (B) Papain bromelin and ficin

Solution:

These three fruits are well-known sources of potent proteolytic enzymes, which are enzymes that break down proteins.

The enzyme found in papaya is called papain.

The enzyme found in pineapple is called bromelain.

The enzyme found in figs is called ficin.

The question asks for the enzymes present in all three fruits.

Therefore, the correct answer lists all three: papain, bromelain, and ficin.

Quick Tip

Memorize the fruit-enzyme pairs used as meat tenderizers: Papaya → Papain, Pineapple → Bromelain, Fig → Ficin.

56. Egg shell is composed of :

- (A) Calcium carbonate
- (B) Magnesium carbonate
- (C) Calcium sulphate
- (D) Manganese carbonate

Correct Answer: (A) Calcium carbonate

Solution:

The eggshell provides a protective barrier for the egg's contents.

It is a semi-permeable membrane, allowing air and moisture to pass through its pores.

The primary chemical component of the eggshell, making up about 94% of its dry weight, is calcium carbonate (CaCO_3).

The remaining portion consists of an organic protein matrix and small amounts of other minerals like magnesium carbonate and calcium phosphate.

Quick Tip

Just like limestone and seashells, the hard material of an eggshell is predominantly made of a simple chemical compound: calcium carbonate (CaCO_3).

57. As per FSSAI regulation what is the fat content (percent) in whole milk powder:

- (A) Not less than 26
- (B) Not less than 2
- (C) Not more than 1.5
- (D) Not more than 28

Correct Answer: (A) Not less than 26

Solution:

The Food Safety and Standards Authority of India (FSSAI) sets the legal standards for food products sold in the country.

According to the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, whole milk powder is defined based on its milk fat and milk solids content.

The standard specifies that the milk fat content in whole milk powder must be "Not less than 26.0 percent" by weight.

The option "Not more than 1.5%" refers to the standard for skimmed milk powder.

Quick Tip

Remember the key difference in FSSAI standards: Whole Milk Powder must be high in fat ($\geq 26\%$), while Skimmed Milk Powder must be very low in fat ($\leq 1.5\%$).

58. Milk product obtained by acid coagulation of hot milk and subsequent drainage of whey:

- (A) Curds
- (B) Rasogolla
- (C) Paneer
- (D) Sandesh

Correct Answer: (C) Paneer

Solution:

This question describes the fundamental manufacturing process for paneer, a type of fresh, unaged, non-melting cheese common in India.

The process involves heating milk to a high temperature (near boiling).

An acidulant (like lemon juice, vinegar, or citric acid) is then added, which causes the major milk protein, casein, to coagulate and separate from the liquid whey.

This solid coagulum is then strained, typically in a cheesecloth, to drain the whey and pressed to form a block of paneer.

Curds (dahi) are made by bacterial fermentation, not direct acid coagulation.

Quick Tip

The key to identifying paneer production is the combination of "heat" and "acid" to coagulate milk. This is different from making dahi/curd, which uses bacterial fermentation at a lower temperature.

59. Whey proteins are:

- (A) Gamma globulins, alpha lactoglobulins
- (B) Beta lactoglobulins, alpha lactoglobulins

(C) Casein, lactalbumin

(D) Casein, beta lactoglobulins

Correct Answer: (A) Gamma globulins, alpha lactoglobulins

Solution:

Milk contains two major classes of proteins: caseins and whey proteins.

When milk is coagulated (by acid or rennet), the caseins form the solid curd, and the whey proteins remain dissolved in the liquid whey.

Whey protein is a collective term for several globular proteins. The major ones are beta-lactoglobulin and alpha-lactalbumin.

Minor proteins include immunoglobulins (also known as gamma globulins) and serum albumin.

The keyed answer lists "Gamma globulins" and "alpha lactoglobulins" (likely a typo for alpha-lactalbumin). Both are indeed components of the whey protein fraction, making this the correct option as per the provided key.

Quick Tip

Remember the two main protein groups in milk: Caseins (80%, form the curd) and Whey Proteins (20%, remain in the liquid). Major whey proteins are beta-lactoglobulin and alpha-lactalbumin.

60. Eyes are characteristic feature of:

(A) Ice cream

(B) Khoa

(C) Swiss cheese

(D) Cottage cheese

Correct Answer: (C) Swiss cheese

Solution:

In the context of cheese, the term "eyes" refers to the round holes or openings within the cheese body.

These eyes are a hallmark feature of Swiss-type cheeses, such as Emmental.

They are formed during the ripening process by bubbles of carbon dioxide (CO₂) gas.

The gas is produced by the metabolism of specific starter culture bacteria, most notably *Propionibacterium freudenreichii* subsp. *shermanii*.

This bacterium ferments lactic acid into propionic acid, acetic acid, and CO₂. The trapped CO₂ gas forms the characteristic "eyes".

Quick Tip

The "eyes" in Swiss cheese are not made by mice! They are gas bubbles of CO₂ produced by *Propionibacterium* bacteria during ripening.

61. Heat transfer by convection occurs in:

- (A) Solids
- (B) Solids and liquids
- (C) Solid surface to liquids and gases
- (D) Gases

Correct Answer: (C) Solid surface to liquids and gases

Solution:

Heat transfer has three modes: conduction, convection, and radiation.

Convection is the transfer of heat through the bulk movement of fluids (liquids and gases). The fluid molecules move from a hotter region to a colder region, carrying heat with them.

Conduction is the primary mode of heat transfer in solids.

In engineering and food processing, convection typically describes the transfer of heat between a solid boundary and a moving fluid. Examples include boiling water in a pot or baking with a convection oven.

Therefore, the option "Solid surface to liquids and gases" best describes the practical context where heat transfer by convection takes place.

Quick Tip

While convection is the movement of heat within fluids (liquids/gases), in practical applications, it almost always refers to the heat exchange that happens between a solid surface and a moving fluid.

62. Super-heated steam is produced at:

- (A) Boiling point
- (B) Above boiling point
- (C) Below boiling point
- (D) At boiling point

Correct Answer: (B) Above boiling point

Solution:

When water is heated at a constant pressure, its temperature rises until it reaches the boiling point (e.g., 100°C at 1 atm).

At the boiling point, further addition of heat converts the liquid water into steam (water vapor) at that same temperature. This is known as saturated steam.

If this saturated steam is separated from the liquid water and heated further, its temperature will increase above the boiling point for that pressure.

This steam, which is at a temperature higher than its saturation temperature, is called super-heated steam.

Quick Tip

Think of steam in two stages: 1. Saturated steam is steam at the boiling point. 2. Superheated steam is steam that has been heated even more, to a temperature above the boiling point.

63. The filter press commonly used in oil mill is:

- (A) Continuous type pressure filter
- (B) Continuous type vacuum filter
- (C) Discontinuous type pressure filter
- (D) Discontinuous type vacuum filter

Correct Answer: (C) Discontinuous type pressure filter

Solution:

A plate-and-frame filter press is a standard piece of equipment for separating solids from crude vegetable oil in an oil mill.

It operates by pumping the oil slurry under high pressure into a series of chambers lined with filter cloth.

The oil passes through the cloth, while the solid impurities (known as filter cake) are retained.

The process is inherently a batch or discontinuous operation. Once the chambers are filled with cake and the flow of oil slows, the press must be stopped, opened, the cake removed, and then reassembled for the next batch.

Therefore, it is a discontinuous type pressure filter.

Quick Tip

A filter "press" works by squeezing liquid out, leaving a solid cake behind. Because you have to stop the machine to remove this cake, it is a batch or "discontinuous" operation that uses "pressure".

64. Separation of solids from solid is called as:

- (A) Filtration
- (B) Sedimentation

(C) Centrifugation

(D) Sieving

Correct Answer: (D) Sieving

Solution:

The question asks for a method to separate a mixture consisting only of solids.

Filtration, sedimentation, and centrifugation are all methods used to separate solids from a fluid (a liquid or a gas).

Sieving, also known as sifting, is a mechanical process for separating a mixture of solid particles into different fractions based on their size.

This is done by passing the mixture over a screen or mesh with specific size openings. Particles smaller than the openings pass through, while larger particles are retained.

Quick Tip

Remember the phases involved in separation: separating a solid from a fluid is filtration. Separating solids from other solids based on particle size is sieving.

65. The milk is ____ to increase the keeping quality so that it does not spoil during distribution.

(A) Homogenised

(B) Defatted

(C) Pasteurized

(D) Fortified

Correct Answer: (C) Pasteurized

Solution:

The primary goal of increasing the "keeping quality" or shelf life of milk is to prevent spoilage.

Milk spoilage is mainly caused by the growth of microorganisms.

Pasteurization is a mild heat treatment process specifically designed to kill harmful pathogenic bacteria and significantly reduce the number of spoilage organisms.

By reducing the microbial load, pasteurization makes the milk safe to drink and extends its shelf life under refrigeration.

Homogenization prevents fat separation, defatting removes fat, and fortification adds nutrients; none of these processes are aimed at preventing microbial spoilage.

Quick Tip

The main purpose of pasteurization is to ensure safety and extend shelf life by killing microbes with heat. All other processes like homogenization or fortification serve different purposes.

66. Instrument used to test specific gravity of milk and adulteration of milk by water:

- (A) Hydrometer
- (B) Penetrometer
- (C) Lactometer
- (D) Colorimeter

Correct Answer: (C) Lactometer

Solution:

A lactometer is a specialized type of hydrometer.

A hydrometer is an instrument used for measuring the specific gravity (or relative density) of liquids.

The lactometer is specifically calibrated for the range of specific gravities found in milk.

Since water is less dense than milk, adding water will lower the milk's specific gravity.

By measuring the specific gravity with a lactometer and comparing it to the standard value for pure milk, one can quickly and easily detect adulteration by water.

Quick Tip

The prefix "Lacto-" refers to milk. Therefore, a "lactometer" is a meter used to measure a property of milk, specifically its density (specific gravity) to check for added water.

67. Guidelines for nutritional labelling has been published by:

- (A) ISO 14000
- (B) ISO 9000
- (C) Codex Alimentarius Commission
- (D) ISO 22000

Correct Answer: (C) Codex Alimentarius Commission

Solution:

The Codex Alimentarius Commission was established by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO).

Its primary mandate is to develop international food standards, guidelines, and codes of practice to protect consumer health and ensure fair practices in the food trade.

Codex has published extensive "Guidelines on Nutrition Labelling" which serve as the global reference point for countries creating their own national labelling laws.

The ISO standards listed relate to environmental management (14000), quality management (9000), and food safety management (22000), not nutrition labelling guidelines.

Quick Tip

For any question about international food standards, guidelines, or codes of practice, the Codex Alimentarius Commission (run by FAO/WHO) is the most likely correct answer.

68. Turmeric is adulterated with:

- (A) Auramine
- (B) Metanil yellow
- (C) Rhodamine B
- (D) Orange-II

Correct Answer: (B) Metanil yellow

Solution:

Adulteration of spices with non-permitted colors is a common fraudulent practice.

Turmeric powder is valued for its bright yellow-orange color, which comes from the compound curcumin.

Metanil yellow is a cheap, synthetic, non-permitted coal tar dye with a vibrant yellow color.

It is illegally used as an adulterant to enhance the color of poor-quality or exhausted turmeric powder to make it more appealing to consumers.

Metanil yellow is a known health hazard and its use in food is banned.

Quick Tip

The most infamous and commonly cited adulterant for turmeric powder is Metanil yellow. This is a classic example of economic adulteration using a harmful substance.

69. ISO9001:2008 Quality Management System deals with:

- (A) Fundamentals and vocabulary
- (B) Management
- (C) Requirements
- (D) Performance improvement

Correct Answer: (C) Requirements

Solution:

The ISO 9000 family of standards addresses various aspects of quality management.

ISO 9000 lays out the "Fundamentals and vocabulary" for quality management systems.

ISO 9001 specifies the "Requirements" an organization must meet to demonstrate its ability to consistently provide products and services that meet customer and regulatory needs. This is the standard against which organizations are certified.

ISO 9004 provides guidance on achieving sustained success and "Performance improvement".

The question specifically asks about ISO 9001, which is the standard outlining the requirements.

Quick Tip

Remember the roles of the main ISO 9000 standards: ISO 9000 is the "dictionary," ISO 9001 is the "rulebook" for certification (requirements), and ISO 9004 is the "guidebook" for improvement.

70. Adulterant found in watermelon fruits:

- (A) Carmosine
- (B) Erythrosine
- (C) Rhodamine B
- (D) Auramine

Correct Answer: (B) Erythrosine

Solution:

A common form of adulteration involves injecting fruits like watermelon with artificial dyes to make their flesh appear a more intense and uniform red color, thus seeming fresher and more appealing.

Erythrosine, also known as FD&C Red No. 3, is a synthetic, cherry-pink food dye.

While it is permitted for specific food uses (like coloring maraschino cherries), its injection into fresh fruit is an illegal and fraudulent practice.

It has been identified in many cases as the dye used for adulterating watermelons.

Quick Tip

The injection of artificial colors into fresh produce is a form of adulteration. Erythrosine is a red dye commonly associated with this illegal practice in watermelons to enhance the color of the flesh.

71. Which of the following statement is true for enantiomers?

- (A) Optical isomers that are superimposable mirror images
- (B) Isomers which differ in their configuration around a single carbon atom
- (C) Stereoisomers that are non-superimposable and non-mirror images
- (D) Stereoisomers that are non-superimposable mirror images

Correct Answer: (D) Stereoisomers that are non-superimposable mirror images

Solution:

Stereoisomers are molecules that have the same molecular formula and sequence of bonded atoms, but differ in the three-dimensional orientations of their atoms in space.

Enantiomers are a specific type of stereoisomer.

They are defined as pairs of molecules that are mirror images of each other but cannot be superimposed on one another.

A classic analogy is a person's left and right hands – they are mirror images but cannot be perfectly overlapped.

Diastereomers are stereoisomers that are not mirror images of each other (Option C).

Epimers are diastereomers that differ at only one chiral center (Option B).

Quick Tip

The key definition for enantiomers is "non-superimposable mirror images". Think of your hands: they are mirror images, but you can't stack one perfectly on top of the other.

72. Trehalose is a combination of:

- (A) Two glucose molecules
- (B) Two maltose molecules
- (C) Two lactose molecules
- (D) Two sucrose molecules

Correct Answer: (A) Two glucose molecules

Solution:

Trehalose is a disaccharide, meaning it is formed from two monosaccharide units.

Specifically, trehalose is formed by the linkage of two α -glucose molecules.

The bond connects the anomeric carbon of one glucose molecule to the anomeric carbon of the other glucose molecule (α,α -1,1-glycosidic bond).

This unique linkage makes trehalose a non-reducing sugar.

Maltose is also made of two glucose molecules, but they are linked differently (an α -1,4 bond), making it a reducing sugar.

Quick Tip

Remember the three common glucose-glucose disaccharides and their linkages:

[noitemsep, topsep=0pt]

- Maltose = glucose + glucose (α -1,4)
- Cellobiose = glucose + glucose (β -1,4)
- Trehalose = glucose + glucose (α,α -1,1)

73. The chemical formula of palmitic acid is:

- (A) $\text{CH}_4(\text{CH}_2)_{14}\text{COOH}$
- (B) $\text{CH}_3(\text{CH}_2)_{15}\text{COOH}$
- (C) $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$
- (D) $\text{CH}_3(\text{CH}_3)_{14}\text{COOH}$

Correct Answer: (C) $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$

Solution:

Palmitic acid is a common saturated fatty acid.

Its name indicates that it has 16 carbon atoms in total.

A saturated fatty acid has the general formula $\text{CH}_3(\text{CH}_2)_n\text{COOH}$.

The total number of carbons is $n + 2$ (one in the CH_3 group, n in the CH_2 groups, and one in the COOH group).

For a 16-carbon fatty acid, we have $16 = n + 2$, so $n = 14$.

Therefore, the formula is $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$.

Option (B) represents stearic acid (18 carbons), and options (A) and (D) are chemically incorrect.

Quick Tip

To quickly find the formula for a saturated fatty acid, subtract 2 from the total number of carbons to get the number of (CH_2) units. For palmitic acid (16 carbons), $16 - 2 = 14$, so the formula is $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$.

74. Tartrazine is an:

- (A) Food colouring agent
- (B) Food sweetner

(C) Food fortifier

(D) Food Preservative

Correct Answer: (A) Food colouring agent

Solution:

Tartrazine is a synthetic lemon yellow azo dye.

It is widely used as a food additive to impart a yellow color to various food products.

It is designated as E number E102 in Europe and FD&C Yellow No. 5 in the USA.

It is not a sweetener, a fortifier (a substance that adds nutritional value), or a preservative.

Its sole purpose as a food additive is to provide color.

Quick Tip

Tartrazine is one of the most well-known artificial food colors. Associate it with the color yellow and potential allergic reactions in sensitive individuals.

75. In animals, pantothenic acid is associated with which of the following?

(A) Synthesis of cholesterol

(B) Synthesis of Coenzyme A

(C) Synthesis of thyroid hormones

(D) Synthesis of hemoglobin

Correct Answer: (B) Synthesis of Coenzyme A

Solution:

Pantothenic acid is also known as Vitamin B5.

Its primary and most critical role in metabolism is as a component of Coenzyme A (CoA).

Coenzyme A is a fundamental molecule in biochemistry, playing a vital role in the synthesis and oxidation of fatty acids, and the oxidation of pyruvate in the citric acid cycle (Krebs cycle).

Because Coenzyme A is involved in the synthesis of fats, cholesterol is synthesized via pathways involving CoA, but the most direct and fundamental role of pantothenic acid is the synthesis of CoA itself.

Quick Tip

The "A" in Coenzyme A comes from "acetylation." The core function of Vitamin B5 (Pantothenic acid) is to be a part of this vital coenzyme. If you see Vitamin B5, think Coenzyme A.

76. Limonene is a:

- (A) Ketone
- (B) Quinone
- (C) Terpene
- (D) Ester

Correct Answer: (C) Terpene

Solution:

Limonene is a naturally occurring chemical compound found in the peels of citrus fruits like oranges and lemons.

It is responsible for their characteristic smell.

Chemically, limonene's structure is built from two isoprene units (C_5H_8).

Compounds built from isoprene units are classified as terpenes. Since limonene has two isoprene units ($C_{10}H_{16}$), it is specifically a monoterpene.

It does not contain the functional groups of a ketone, quinone, or ester.

Quick Tip

Terpenes are a large class of natural products responsible for the aroma of many plants. Limonene is the classic example, giving citrus its smell. Remember terpenes are built from isoprene units.

77. The basic difference between chlorophyll a and chlorophyll b is:

- (A) In chlorophyll a, pyrrole ring contains methyl group while in chlorophyll b pyrrole ring contains aldehyde group
- (B) In chlorophyll a, pyrrole ring contains aldehyde group while in chlorophyll b pyrrole ring contains methyl group
- (C) In chlorophyll a, pyrrole ring contains carboxylic group while in chlorophyll b pyrrole ring contains aldehyde group
- (D) In chlorophyll a, pyrrole ring contains methyl group while in chlorophyll b pyrrole ring contains carboxylic group

Correct Answer: (A) In chlorophyll a, pyrrole ring contains methyl group while in chlorophyll b pyrrole ring contains aldehyde group

Solution:

Chlorophyll a and chlorophyll b are the two most common types of chlorophyll found in plants.

Their basic structures are very similar, both consisting of a porphyrin ring with a central magnesium atom and a long phytol tail.

The only structural difference between them is a single side group on one of the pyrrole rings (specifically, at the C7 position of the porphyrin ring).

In chlorophyll a, this side group is a methyl group ($-\text{CH}_3$).

In chlorophyll b, this side group is an aldehyde group ($-\text{CHO}$).

This small change affects the light absorption spectrum of the molecule.

Quick Tip

Remember the difference between chlorophyll a and b with the simple association: a comes before b alphabetically, just as a Methyl group is simpler than an Aldehyde group. So, Chl a has Methyl, Chl b has Aldehyde.

78. *Shigella flexneri* is a:

- (A) gram-negative, nonmotile, facultatively anaerobic, non-spore-forming bacillus
- (B) gram-negative, motile, facultatively anaerobic, non-spore-forming bacillus
- (C) gram-negative, nonmotile, facultatively aerobic, non-spore-forming bacillus
- (D) gram-negative, nonmotile, facultatively anaerobic, spore-forming bacillus

Correct Answer: (A) gram-negative, nonmotile, facultatively anaerobic, non-spore-forming bacillus

Solution:

Shigella is a genus of bacteria belonging to the family Enterobacteriaceae.

Like other members of this family, they are Gram-negative.

Their shape is rod-like, so they are classified as bacillus.

A key characteristic of the *Shigella* genus is that they are nonmotile; they lack flagella.

They are facultative anaerobes, meaning they can grow in the presence or absence of oxygen.

They do not form spores.

Combining all these characteristics, *Shigella flexneri* is a gram-negative, nonmotile, facultatively anaerobic, non-spore-forming bacillus.

Quick Tip

When classifying pathogenic bacteria, remember the key tests: Gram stain (positive or negative), shape (coccus or bacillus), motility, oxygen requirement, and spore formation. For *Shigella*, the key differentiators are being Gram-negative and nonmotile.

79. Mevalonate pathway is associated with the biosynthesis of:

- (A) Cholesterol
- (B) Testosterone
- (C) Thyroid hormones
- (D) Corticosteroids

Correct Answer: (A) Cholesterol

Solution:

The mevalonate pathway is a crucial metabolic pathway present in all higher eukaryotes.

Its primary function is to produce isopentenyl pyrophosphate (IPP) and dimethylallyl pyrophosphate (DMAPP).

These two molecules serve as the fundamental building blocks for a vast array of compounds called isoprenoids or terpenes.

In animals, the most significant end product of this pathway is cholesterol.

Testosterone and corticosteroids are steroid hormones that are themselves synthesized from cholesterol, but the primary synthesis of the core sterol structure occurs via the mevalonate pathway to make cholesterol first.

Quick Tip

The Mevalonate pathway is the "isoprenoid factory". In animals, its main job is to produce cholesterol. All other steroid hormones are then derived from this cholesterol.

80. What represents dx/dt in a microbial growth equation: $dx/dt = x$?

- (A) Rate of change of time
- (B) No change of time
- (C) No change of biomass
- (D) Rate of change of biomass

Correct Answer: (D) Rate of change of biomass

Solution:

In microbial kinetics, standard notation is used for variables.

'x' is typically used to represent the concentration of microbial biomass (e.g., in grams per liter).

't' represents time.

The notation dx/dt is a differential from calculus, which represents the instantaneous rate of change of the variable 'x' with respect to the variable 't'.

Therefore, dx/dt represents the rate of change of biomass concentration over time, which is also known as the growth rate of the microbial population.

The equation $dx/dt = \mu x$ states that this growth rate is proportional to the current biomass concentration, where μ is the specific growth rate.

Quick Tip

In calculus notation, $d(\text{variable1})/d(\text{variable2})$ always means "the rate of change of variable1 with respect to variable2". Here, dx/dt means the rate of change of biomass (x) with respect to time (t).

81. The oxygen dissociation curve of myoglobin is:

- (A) Sigmoid
- (B) Rectangular hyperbola
- (C) Flat
- (D) Hampered

Correct Answer: (B) Rectangular hyperbola

Solution:

An oxygen dissociation curve plots the degree of oxygen saturation of a protein against the partial pressure of oxygen.

Myoglobin is a monomer (it has only one heme group to bind oxygen).

Its binding of oxygen is a simple equilibrium reaction. It binds oxygen very tightly at low oxygen pressures and only releases it when the oxygen pressure becomes extremely low (e.g., in intensely exercising muscle).

This simple, high-affinity binding behavior results in a curve that is a rectangular hyperbola.

Hemoglobin, being a tetramer, exhibits cooperative binding, which means the binding of one oxygen molecule increases the affinity for the next. This cooperative behavior results in a sigmoidal (S-shaped) curve, which is more efficient for oxygen transport.

Quick Tip

Remember the shapes of the oxygen dissociation curves: Myoglobin (storage) = Hyperbolic. Hemoglobin (transport) = Sigmoidal (S-shaped). The S-shape of hemoglobin is due to cooperative binding between its four subunits.

82. Feni is a:

- (A) Wine prepared from cashew nuts
- (B) Wine prepared from grapes
- (C) Wine prepared from mangoes
- (D) Wine prepared from mixture of mangoes and grapes

Correct Answer: (A) Wine prepared from cashew nuts

Solution:

Feni is a traditional liquor produced exclusively in the state of Goa, India.

It is classified as a "country liquor".

There are two main types of Feni: cashew feni and coconut feni.

Cashew feni is made by fermenting the juice of the cashew apple (the fleshy fruit attached to the cashew nut) and then distilling the fermented mash.

The question uses the term "wine" loosely to mean a fermented beverage. The product made from the cashew apple is technically a fruit wine, which is then distilled to make Feni.

Quick Tip

Feni is a unique spirit from Goa, India. The most famous type is made from the cashew apple, the fruit that the cashew nut grows on.

83. Hooke's law states that:

- (A) Stress is irreversible to the strain of ideal solid
- (B) Stress is directly proportional to strain of ideal solid
- (C) Stress is independent of strain of ideal solid
- (D) Strain is proportional to stress of ideal solids

Correct Answer: (B) Stress is directly proportional to strain of ideal solid

Solution:

Hooke's Law is a principle of physics and mechanics of materials that describes the behavior of elastic solids.

It states that for small deformations, the force needed to stretch or compress a spring is directly proportional to the distance of that stretch or compression.

In terms of material properties, this is expressed as: Stress is directly proportional to strain, within the elastic limit of the material.

Mathematically, this is written as $\sigma = E\epsilon$, where σ is stress, ϵ is strain, and E is the constant of proportionality known as the Young's modulus or modulus of elasticity.

Option (D) is equivalent, but the standard statement defines stress as a function of strain.

Quick Tip

The simplest way to remember Hooke's Law is "stress is proportional to strain" ($\sigma \propto \epsilon$). This describes the linear, spring-like behavior of an ideal solid.

84. How many iodine molecules are present in thyroxine?

- (A) 3
- (B) 2
- (C) 1
- (D) 4

Correct Answer: (D) 4

Solution:

Thyroxine is one of the two major hormones produced by the thyroid gland.

Its full chemical name is tetraiodothyronine.

The prefix "tetra-" means four.

The name indicates that the thyroxine molecule contains four atoms of iodine.

For this reason, thyroxine is commonly abbreviated as T4.

The other major thyroid hormone is triiodothyronine (T3), which contains three atoms of iodine.

Quick Tip

The abbreviations for the thyroid hormones tell you the answer: Thyroxine = T4 = 4 iodine atoms. Triiodothyronine = T3 = 3 iodine atoms.

85. World food day is celebrated every year on:

- (A) October 16
- (B) January 16
- (C) December 16
- (D) March 16

Correct Answer: (A) October 16

Solution:

World Food Day is an international day celebrated every year around the world.

It is observed on October 16th to commemorate the date of the founding of the Food and Agriculture Organization (FAO) of the United Nations.

The FAO was founded on October 16, 1945.

The day is celebrated to raise awareness of poverty and hunger and to promote action for food security and nutritious diets for all.

Quick Tip

Associate World Food Day with the founding of the Food and Agriculture Organization (FAO). Both events share the same date: October 16.

86. Butyrometer is used to:

- (A) Detect water percentage in milk
- (B) Detect fat percentage in milk
- (C) Detect protein content in milk
- (D) Detect fat percentage in Oils

Correct Answer: (B) Detect fat percentage in milk

Solution:

The Gerber method is a common and rapid test used in the dairy industry to determine the fat content of milk and milk products.

A butyrometer is a specialized piece of glassware used specifically for this test.

In the Gerber method, a measured volume of milk is mixed with sulfuric acid and amyl alcohol in the butyrometer.

The mixture is then centrifuged, which causes the fat to separate and collect in the calibrated neck of the butyrometer.

The percentage of fat can then be read directly from the scale on the neck.

Quick Tip

The prefix "Butyro-" relates to butter or fat (from butyric acid, a fatty acid). Therefore, a "butyrometer" is a meter used to measure fat, specifically in milk via the Gerber method.

87. Sequence of steps in gram's staining technique in the identification of bacteria are:

- (A) Crystal violet - ethanol - Grams Iodine - Safranin
- (B) Crystal violet - Safranin - Grams Iodine - ethanol
- (C) Crystal violet - ethanol - Safranin - Grams Iodine
- (D) Crystal violet - Grams Iodine - ethanol - Safranin

Correct Answer: (D) Crystal violet - Grams Iodine - ethanol - Safranin

Solution:

Gram staining is a differential staining technique used to classify bacteria into two large groups: Gram-positive and Gram-negative.

The correct sequence of reagents is crucial for the procedure to work.

1. Primary Stain: Crystal Violet is applied to stain all cells purple.
2. Mordant: Gram's Iodine is added. It forms a complex with the crystal violet, making it harder to remove.
3. Decolorizer: Ethanol (or an acetone-ethanol mixture) is applied. It dehydrates the thick peptidoglycan layer of Gram-positive cells, trapping the stain. In Gram-negative cells, it dissolves the outer membrane and washes the purple stain out.
4. Counterstain: Safranin is applied. It stains the now-colorless Gram-negative cells pink/red, while the Gram-positive cells remain purple.

Quick Tip

Remember the Gram stain steps with the acronym C-I-A-S: Crystal Violet (stain), Iodine (mordant), Alcohol (decolorize), Safranin (counterstain).

88. Which of the following is correct about α -amino acids?

- (A) All α -amino acids contain an asymmetric carbon atoms
- (B) In nature, they are always present in optically active form
- (C) They are always exist in L forms
- (D) In nature, they are present in both L and D forms

Correct Answer: (D) In nature, they are present in both L and D forms

Solution:

Let's analyze the options for α -amino acids.

- (A) This is false. Glycine is the simplest amino acid, and its α -carbon is bonded to two hydrogen atoms, so it is not an asymmetric (chiral) carbon.
- (B) This is false. Since glycine is not chiral, it is not optically active.
- (C) This is mostly true for proteins in higher organisms, where almost all amino acids are in the L-form. However, D-amino acids are found in nature, particularly in bacterial cell walls and some antibiotics. Therefore, stating they "always" exist in L forms is incorrect in a broader biological context.
- (D) This is the most accurate statement. While L-amino acids are far more common in proteins, D-amino acids also exist in nature (e.g., in bacteria, some marine invertebrates). Therefore, nature as a whole contains both L and D forms.

Quick Tip

Be careful with absolute terms like "all" and "always". For amino acids, Glycine is the exception to chirality. And while L-forms dominate in proteins, D-forms exist in other parts of nature, especially in the microbial world.

89. Codex Alimentarius Commission is an international food standard commission?

- (A) Jointly established by Food and Agriculture Organization and the World Health Organization
- (B) Established by HACCP
- (C) Established by FSSAI
- (D) Jointly established by FSSAI and HACCP

Correct Answer: (A) Jointly established by Food and Agriculture Organization and the World Health Organization

Solution:

The Codex Alimentarius Commission (CAC), often simply referred to as Codex, is the central body of the Joint FAO/WHO Food Standards Programme.

It was established in the early 1960s.

Its creation was a joint initiative by two specialized agencies of the United Nations: the Food and Agriculture Organization (FAO) and the World Health Organization (WHO).

The purpose of Codex is to develop international food standards, guidelines, and codes of practice to protect consumer health and ensure fair trade practices.

HACCP is a system, not an organization, and FSSAI is India's national food authority.

Quick Tip

Codex is the top-level international food standards body. Remember that it's a joint effort by two major UN agencies: the FAO (dealing with food production) and the WHO (dealing with health).

90. Heat sterilization method to inactivate deleterious enzymes prior to canning, freezing and drying is ____.

- (A) Sterilization
- (B) Pasteurization

- (C) Leaching
- (D) Blanching

Correct Answer: (D) Blanching

Solution:

The question describes a heat treatment used as a preparatory step before other preservation methods like canning, freezing, and drying.

The main purpose of this step is to inactivate enzymes that could cause quality degradation (e.g., off-flavors, color changes) during storage.

This process is known as blanching. It involves briefly exposing the food, usually vegetables, to boiling water or steam.

Sterilization and pasteurization are complete preservation methods in themselves, not pre-treatments for other methods. Leaching is the loss of water-soluble nutrients, which can be an undesirable side effect of blanching, not its purpose.

Quick Tip

The key term here is "prior to" other preservation methods. Blanching is the go-to pre-treatment step used to inactivate enzymes before freezing, canning, or drying to preserve food quality.

91. The scientific name of barley is:

- (A) *Triticum vulgare*
- (B) *Hordeum vulgare*
- (C) *Vigna mungo*
- (D) *Oryza sativum*

Correct Answer: (B) *Hordeum vulgare*

Solution:

Scientific names, or binomial nomenclature, are used to classify organisms.

Triticum vulgare (also known as *Triticum aestivum*) is the scientific name for common wheat.

Hordeum vulgare is the scientific name for common barley.

Vigna mungo is the scientific name for black gram (urad dal).

Oryza sativa is the scientific name for Asian rice.

Quick Tip

It's useful to memorize the scientific names for the major cereal grains: Wheat (*Triticum*), Barley (*Hordeum*), Rice (*Oryza*), and Corn (*Zea*).

92. The mathematical equation of enthalpy (H) is:

(A) $H = U + pV$

(B) $H = U - pV$

(C) $H = U / pV$

(D) $H = pV$

Correct Answer: (A) $H = U + pV$

Solution:

Enthalpy (H) is a thermodynamic property of a system.

It is defined as the sum of the internal energy (U) of the system plus the product of its pressure (p) and volume (V).

This pV term represents the "flow work" or the energy required to establish the system's physical presence in its environment.

Therefore, the correct mathematical definition of enthalpy is $H = U + pV$.

Quick Tip

Enthalpy (H) represents the total heat content of a system. Remember the equation $H = U + pV$, where U is the internal energy and pV is the work done by the system on its surroundings.

93. Caffeine belongs to ____ class.

- (A) Methylxanthine
- (B) Ethylxanthine
- (C) Trimethylhydroxanthine
- (D) Tetrahydromethylxanthine

Correct Answer: (A) Methylxanthine

Solution:

Caffeine is a central nervous system stimulant.

Its chemical structure is based on a purine ring system known as xanthine.

Specifically, caffeine's chemical name is 1,3,7-trimethylxanthine, meaning it has three methyl groups attached to the xanthine backbone.

Because its core structure is a xanthine with methyl groups attached, it belongs to the general class of compounds called methylxanthines.

Other methylxanthines include theobromine (in chocolate) and theophylline (in tea).

Quick Tip

Caffeine is a "methylated xanthine." Theobromine and theophylline are also methylxanthines. They are all related plant alkaloids with stimulant properties.

94. Water activity is defined as:

- (A) the vapour pressure of water in substance

- (B) a ratio of the vapour pressure of water in substance to vapour pressure of pure water at the different temperatures
- (C) a ratio of the vapour pressure of water in substance to vapour pressure of pure water at the same temperature
- (D) vapour pressure of pure water

Correct Answer: (C) a ratio of the vapour pressure of water in substance to vapour pressure of pure water at the same temperature

Solution:

Water activity (a_w) is a measure of the "free" or "available" water in a food system for microbial growth and chemical reactions.

It is formally defined by a thermodynamic relationship.

Water activity is the ratio of the water vapor pressure of the food (P) to the vapor pressure of pure water (P_0) at the same temperature.

The formula is $a_w = P / P_0$.

The "same temperature" clause is critical, as vapor pressure is highly dependent on temperature.

Quick Tip

Remember the formula for water activity: $a_w = P_{food} / P_{water}$. It's a ratio, so it's a unitless value from 0 to 1. Pure water has an a_w of 1.0. Lowering a_w is a key principle of food preservation.

95. High gravity wort refers to a brew where the original gravity is significantly higher than standard and ranges between:

- (A) 13-18° Plato.
- (B) 18-20° Plato.
- (C) 20-25° Plato.
- (D) 25-30° Plato.

Correct Answer: (A) 13-18° Plato.

Solution:

In brewing, "gravity" refers to the specific gravity or density of the wort (the sugary liquid extracted from malted barley).

It is a measure of the dissolved sugar content, which will be fermented into alcohol.

"High gravity brewing" is a technique where a very concentrated wort is produced and fermented. The resulting high-alcohol beer is then diluted with water to the desired final strength.

Standard strength worts are typically around 10-12° Plato.

Worts considered to be "high gravity" for large-scale commercial brewing generally start in the range of 13° to 18° Plato.

While higher gravities are possible, this range represents the typical industrial definition of high gravity brewing.

Quick Tip

Degrees Plato (°P) is a measure of the percentage of dissolved solids (mostly sugar) by weight in wort. Standard beer wort is 12°P. "High gravity" is anything significantly above that, with the 13-18°P range being a common industrial standard.

96. Penetrometer is a device to:

- (A) Measure the tenderness of meat
- (B) Measure the taste of meat
- (C) Measure the colour of meat
- (D) Measure the quantity of meat

Correct Answer: (A) Measure the tenderness of meat

Solution:

A penetrometer is an instrument used to measure the hardness or consistency of a material.

It works by measuring the force required to push a probe (a cone, needle, or plunger) into a sample, or the distance the probe penetrates under a fixed weight.

In food science, it is used to objectively measure texture.

For meat, tenderness is a critical textural attribute. A penetrometer can be used to measure the force needed to shear through or penetrate the meat, providing an objective measurement of its tenderness.

It does not measure taste, color, or quantity.

Quick Tip

The word "penetrometer" literally means "penetration meter." It measures how easily something can be penetrated, which is a direct way to quantify textural properties like firmness, consistency, or tenderness.

97. What are the factors that affects fluid flow regimes?

- (A) Mass flow rate, density, viscosity of fluid and geometry of the flow channel
- (B) Mass flow rate and geometry of the flow channel
- (C) Density and viscosity of the fluid
- (D) Geometry of the flow channel only

Correct Answer: (A) Mass flow rate, density, viscosity of fluid and geometry of the flow channel

Solution:

Fluid flow regimes, primarily whether the flow is laminar or turbulent, are determined by a dimensionless number called the Reynolds number (Re).

The formula for the Reynolds number in a pipe is $Re = (\rho v D) / \mu$.

Here, ρ is the fluid density, v is the fluid velocity (related to mass flow rate), D is the pipe diameter (geometry), and μ is the fluid viscosity.

This formula shows that the flow regime depends on the fluid's properties (density and viscosity), the flow condition (velocity/mass flow rate), and the system's physical dimensions

(geometry).

Therefore, all the listed factors affect the fluid flow regime.

Quick Tip

The transition between laminar and turbulent flow is governed by the Reynolds number. The formula for the Reynolds number includes all four key factors: fluid density, fluid velocity, pipe diameter (geometry), and fluid viscosity.

98. Which of the following diseases occurs due to vitamin deficiency:

- (A) Hyperthyroidism and hypothyroidism
- (B) Pellagra and Beriberi
- (C) Phenylketonuria and alkaptonuria
- (D) Myositis and Myasthenia gravis

Correct Answer: (B) Pellagra and Beriberi

Solution:

Vitamins are essential micronutrients, and their deficiency leads to specific diseases.

Beriberi is a disease caused by a deficiency of Vitamin B1 (Thiamine).

Pellagra is a disease caused by a deficiency of Vitamin B3 (Niacin).

Hypothyroidism is often caused by iodine deficiency. Hyperthyroidism is an overactive thyroid.

Phenylketonuria and alkaptonuria are genetic metabolic disorders.

Myositis and Myasthenia gravis are autoimmune/inflammatory muscle diseases.

Therefore, Pellagra and Beriberi are the diseases listed that are caused by vitamin deficiencies.

Quick Tip

Memorize the classic vitamin deficiency diseases: Beriberi (B1), Pellagra (B3), Scurvy (C), Rickets (D), and Night Blindness (A). These are frequently asked in exams.

99. Maillard browning is a:

- (A) Enzymatic reaction between amino acids and reducing sugars
- (B) Non-enzymatic reaction between amino acids and reducing sugars
- (C) Enzymatic reaction between amino acids and lipids
- (D) Non-enzymatic reaction between amino acids and lipids

Correct Answer: (B) Non-enzymatic reaction between amino acids and reducing sugars

Solution:

The Maillard reaction is a complex series of chemical reactions responsible for the desirable brown color and flavor of many cooked foods, such as baked bread, seared steak, and roasted coffee.

This reaction is a form of non-enzymatic browning, meaning it occurs due to heat without the involvement of enzymes.

The key chemical reactants required for the Maillard reaction are an amino acid (from proteins) and a reducing sugar (like glucose or fructose).

The presence of heat accelerates the reaction significantly.

Quick Tip

The Maillard reaction is the flavor of "browning." Remember the recipe: Amino Acid + Reducing Sugar + Heat. It's non-enzymatic, unlike the browning of a cut apple.

100. What is the principle of centrifugation?

- (A) Sedimentation principle

- (B) Filtration principle
- (C) Evaporation principle
- (D) Size reduction principle

Correct Answer: (A) Sedimentation principle

Solution:

Centrifugation is a mechanical process used to separate components in a mixture based on their density.

The process relies on the principle of sedimentation.

Sedimentation is the tendency for particles in suspension to settle out of the fluid in which they are entrained and come to rest against a barrier. This is due to the force of gravity (or a similar force).

A centrifuge works by spinning the mixture at a very high speed, which generates a powerful centrifugal force.

This centrifugal force is many times stronger than gravity and dramatically accelerates the rate of sedimentation, causing denser particles to move to the bottom of the container much faster.

Quick Tip

Think of centrifugation as "super-fast gravity." It works by accelerating the natural process of sedimentation, where denser things sink.

101. The basic law of fluid flow through porous media is known as:

- (A) Boltzmann law
- (B) Bernoulli's law
- (C) Darcy Law
- (D) Stokes law

Correct Answer: (C) Darcy Law

Solution:

This question asks for the fundamental law governing fluid flow in a porous medium, such as water through soil or a liquid through a packed bed filter.

Darcy's Law is the equation that describes this phenomenon.

It states that the rate of fluid flow through a porous medium is proportional to the pressure gradient and the hydraulic conductivity of the medium.

Bernoulli's law describes energy conservation in a moving fluid in open channels or pipes.

Stokes' law describes the drag force on a sphere moving through a viscous fluid.

Quick Tip

Associate the laws with their application: Bernoulli's Law → pipe flow energy. Stokes' Law → particle settling. Darcy's Law → flow through a porous medium (like a filter bed or soil).

102. Which of the following is a size reduction unit operation in liquids?

- (A) Milling
- (B) Homogenization
- (C) Grinding
- (D) Mixing

Correct Answer: (B) Homogenization

Solution:

The question asks for a size reduction operation that is performed on components within a liquid.

Milling and grinding are terms for size reduction of solid materials.

Mixing is an operation to combine ingredients, not primarily to reduce particle size.

Homogenization is a process specifically designed to reduce the size of particles or droplets dispersed in a liquid and to make their distribution uniform.

The most common example is the homogenization of milk, where large fat globules are forced through a narrow gap at high pressure to break them down into much smaller droplets that remain suspended.

Quick Tip

Milling and grinding are for solids. Homogenization is for reducing the size of droplets (like fat in milk) or suspended particles within a liquid to create a stable emulsion or suspension.

103. If the value of Reynolds number ≤ 10000 for an impeller, the power number:

- (A) Increases first and then decreases with an increase in impeller Reynolds number
- (B) Increase with an increase in impeller Reynolds number
- (C) Remains constant with an increase in impeller Reynolds number
- (D) Decreases first and then increases with an increase in impeller Reynolds number

Correct Answer: (C) Remains constant with an increase in impeller Reynolds number

Solution:

The power number (N_p) is a dimensionless parameter used to relate the power consumed by an impeller to its operating conditions.

The impeller Reynolds number (Re_i) characterizes the flow regime in a stirred tank (laminar, transitional, or turbulent).

For low Reynolds numbers (laminar flow), the power number is inversely proportional to Re_i .

For intermediate Reynolds numbers (transitional flow), the power number changes in a complex way.

However, once the Reynolds number becomes very high (typically $Re_i \geq 10,000$), the flow in the tank is fully turbulent.

In the fully turbulent regime, the power number becomes independent of the Reynolds number and remains constant for a given impeller geometry.

Quick Tip

For mixing, remember the power curve. In the fully turbulent region ($Re \geq 10,000$), the power number becomes constant. This means power consumption is then proportional to the cube of the impeller speed and the fifth power of its diameter.

104. In a feedback control of milk heat exchanger:

- (A) A thermometer measures the temperature of the milk coming out of the heat exchanger and sends to the controller a measurement signal
- (B) Temperature of the milk is not measured through feedback control of milk heat exchanger
- (C) A thermometer measures the temperature of the milk entering the heat exchanger and sends a measurement signal to the controller.
- (D) A thermometer measures the temperature of the milk entering the heat exchanger first and then measure temperature coming out of the heat exchanger

Correct Answer: (A) A thermometer measures the temperature of the milk coming out of the heat exchanger and sends to the controller a measurement signal

Solution:

Feedback control is a type of control system where the output of the process is measured and compared to a desired setpoint.

In the context of a milk heat exchanger (like a pasteurizer), the desired output is the final temperature of the milk after heating.

Therefore, a sensor (a thermometer) must be placed at the outlet of the heat exchanger to measure the actual final temperature of the milk.

This measured value is then "fed back" to a controller. The controller compares this value to the setpoint (e.g., 72°C) and adjusts the heating medium (e.g., the flow of hot water) to correct any deviation.

Measuring the inlet temperature is part of a feedforward control strategy, not feedback control.

Quick Tip

Think of "feedback" control like driving a car. You look at the output (your position on the road) and make corrections to the input (steering wheel). For a pasteurizer, you measure the final milk temperature (output) and adjust the heat (input).

105. The process of food preservation using drying technique:

- (A) Increases water activity
- (B) No change in water activity
- (C) Reduces water activity
- (D) Independent of water activity

Correct Answer: (C) Reduces water activity

Solution:

Food preservation techniques aim to inhibit or prevent the growth of spoilage microorganisms.

Microorganisms require a certain level of available water to grow. This available water is measured by the parameter called water activity (a_w).

Drying is a preservation method that works by physically removing water from the food.

By removing water, the concentration of solutes in the remaining water increases, and the amount of free water available for microbial use decreases significantly.

This directly results in a reduction of the food's water activity to a level below which most bacteria, yeasts, and molds cannot grow.

Quick Tip

The fundamental principle of preservation by drying is the reduction of water activity (a_w). Less water means less microbial growth, leading to a longer shelf life.

106. If a culture starts with 500 bacteria and doubles every hour, how many bacteria will there be after 4 hours?

(A) 4×10^3

(B) 8×10^3

(C) 6×10^3

(D) 5×10^3

Correct Answer: (B) 8×10^3

Solution:

This is a problem of exponential growth. The formula for exponential growth is $N(t) = N_0 2^{(t/d)}$, where $N(t)$ is the final number, N_0 is the initial number, t is the total time, and d is the doubling time.

Initial number of bacteria (N_0) = 500.

Doubling time (d) = 1 hour.

Total time (t) = 4 hours.

After 1 hour: $500 \times 2 = 1000$

After 2 hours: $1000 \times 2 = 2000$

After 3 hours: $2000 \times 2 = 4000$

After 4 hours: $4000 \times 2 = 8000$

In scientific notation, 8000 is written as 8×10^3 .

Quick Tip

For doubling problems, you can simply multiply the initial number by 2 for each doubling period. Here, with 4 periods (hours), you calculate $500 \times 2 \times 2 \times 2 \times 2$.

107. PFA act was established in the year:

(A) 1954

(B) 1955

(C) 1956

(D) 1965

Correct Answer: (A) 1954

Solution:

The PFA Act stands for the Prevention of Food Adulteration Act.

This was the primary central legislation governing food safety and quality in India for many decades.

The PFA Act was enacted by the Parliament of India in the year 1954.

It came into force on June 1, 1955.

This act has since been repealed and replaced by the comprehensive Food Safety and Standards Act (FSSA) of 2006.

Quick Tip

Remember the key dates for Indian food law: The old law, the Prevention of Food Adulteration (PFA) Act, was passed in 1954. The new law, the Food Safety and Standards Act (FSSA), was passed in 2006.

108. Alpha tocopherol contains:

(A) No methyl group attached to chromanol ring

(B) One methyl group attached to chromanol ring

(C) Eight methyl groups attached to chromanol ring

(D) Three methyl groups attached to chromanol ring

Correct Answer: (D) Three methyl groups attached to chromanol ring

Solution:

Tocopherols are a class of chemical compounds that exhibit Vitamin E activity.

Their basic structure consists of a chromanol ring and a long phytol tail.

There are four main types of tocopherols: alpha (α), beta (β), gamma (γ), and delta (δ).

They differ from each other only in the number and position of methyl ($-\text{CH}_3$) groups attached to the chromanol ring.

Alpha-tocopherol, which has the highest biological activity, has three methyl groups attached to the chromanol ring at positions 5, 7, and 8.

Beta- and gamma-tocopherols have two methyl groups, and delta-tocopherol has one.

Quick Tip

The different forms of Vitamin E (tocopherols) are named based on their methyl groups on the chromanol ring: alpha has 3, beta/gamma have 2, and delta has 1. Alpha-tocopherol is the most active form.

109. The relationship between pressure drop and velocity follows:

- (A) Hooke's law
- (B) Stokes' Law
- (C) Bernoulli Law
- (D) Venturi's Law

Correct Answer: (C) Bernoulli Law

Solution:

The Bernoulli principle, derived from Bernoulli's equation, describes the relationship between pressure, velocity, and potential energy in a moving fluid.

A key consequence of this principle is that for a fluid flowing horizontally, an increase in the speed (velocity) of the fluid occurs simultaneously with a decrease in pressure.

This inverse relationship between static pressure and velocity is a fundamental concept in fluid dynamics.

The Venturi effect is a specific application of Bernoulli's principle, but Bernoulli's Law is the fundamental relationship itself.

Quick Tip

Remember the core concept of Bernoulli's principle: Fast-moving fluid = Low pressure. Slow-moving fluid = High pressure. This explains everything from how airplane wings generate lift to how a venturi meter works.

110. Identify the index organism of pasteurization efficacy:

- (A) *Escherichia coli*
- (B) *Bacillus subtilis*
- (C) *Staphylococcus aureus*
- (D) *Coxiella burnetii*

Correct Answer: (D) *Coxiella burnetii*

Solution:

An index organism is a microorganism used to verify the effectiveness of a food processing step like pasteurization.

The ideal index organism should be more heat-resistant than the most heat-resistant pathogen of concern, but not so resistant as to require excessive heat that would damage the food.

For milk pasteurization, the target pathogen was historically *Mycobacterium tuberculosis*.

However, it was discovered that the rickettsial organism *Coxiella burnetii*, which causes Q fever and can be transmitted through milk, is slightly more heat-resistant.

Therefore, pasteurization time-temperature standards are set to guarantee the destruction of *Coxiella burnetii*, ensuring that all less-resistant pathogens are also killed.

Quick Tip

For milk pasteurization, *Coxiella burnetii* is the target or "index" organism. The process is designed to kill it, with the assurance that any other common pathogens will also be destroyed by the heat treatment.

111. Role of Grams Iodine in gram staining technique:

- (A) Enhances the binding of crystal violet to cell wall
- (B) Blocks the binding of crystal violet to cell wall
- (C) Neither blocks nor enhances the binding of crystal violet to cell wall
- (D) Enhances the ability of alcohol to remove the binding of crystal violet to cell wall

Correct Answer: (A) Enhances the binding of crystal violet to cell wall

Solution:

In the Gram staining procedure, Gram's Iodine is used as a mordant.

A mordant is a substance that fixes a stain or dye, making it less easily removed.

After the primary stain (Crystal Violet) is applied, the iodine is added.

The iodine ions interact with the crystal violet molecules to form a large, insoluble Crystal Violet-Iodine (CV-I) complex.

This larger complex gets trapped more effectively within the thick peptidoglycan layer of the Gram-positive bacterial cell wall, thus enhancing the binding and retention of the primary stain.

Quick Tip

In Gram staining, think of Iodine as the "glue" or "anchor." It binds to the Crystal Violet stain, creating a large complex that gets stuck in the thick cell wall of Gram-positive bacteria.

112. Which of the following is a phospholipid?

- (A) Lecithin
- (B) Arachidonic acid
- (C) Ergosterol

(D) Cerebroside

Correct Answer: (A) Lecithin

Solution:

A phospholipid is a type of lipid molecule that is a major component of all cell membranes.

It consists of a glycerol backbone, two fatty acid tails (hydrophobic), and a phosphate group (hydrophilic) which is modified by an alcohol.

Lecithin is a common name for a class of phospholipids known as phosphatidylcholines.

Arachidonic acid is a fatty acid.

Ergosterol is a sterol found in fungi.

A cerebroside is a glycolipid (containing a sugar, not a phosphate group).

Therefore, lecithin is the phospholipid among the options.

Quick Tip

Phospholipids are key emulsifiers and membrane components. Lecithin (phosphatidylcholine) is the most common example, widely found in egg yolks and soybeans.

113. The gelling agent in the preparation of jam is:

(A) Lectin

(B) Rutin

(C) Pectin

(D) Inulin

Correct Answer: (C) Pectin

Solution:

Jam is a gel made from fruit pulp or juice, sugar, and acid.

The substance responsible for the gel structure is pectin.

Pectin is a naturally occurring structural polysaccharide found in the cell walls of plants, particularly in fruits like apples and citrus peels.

When heated in the presence of the correct concentration of sugar and acid, the long pectin molecules cross-link with each other to form a three-dimensional network that traps the liquid, resulting in a gel.

Lectin is a protein, rutin is a flavonoid, and inulin is a storage polysaccharide; none have the gelling properties of pectin under jam-making conditions.

Quick Tip

For jam/jelly making, remember the three essential ingredients for a good gel: Pectin (the gelling agent), Sugar (to bind water), and Acid (to help pectin set).

114. Consumer protection act was established in the year?

- (A) 1987
- (B) 1980
- (C) 1986
- (D) 1979

Correct Answer: (C) 1986

Solution:

The Consumer Protection Act was a landmark piece of legislation in India designed to protect the interests of consumers.

It established consumer rights and provided for the establishment of consumer councils and other authorities for the settlement of consumers' disputes.

This act was enacted by the Parliament of India in the year 1986.

It has been recently replaced by the Consumer Protection Act, 2019, which has introduced updated provisions.

Quick Tip

Remember the year 1986 for the original Consumer Protection Act in India. This was a major step in establishing consumer rights in the country.

115. Spice oils are extracted by a process known as:

- (A) Fermentation
- (B) Steam distillation
- (C) Sublimation
- (D) Milling

Correct Answer: (B) Steam distillation

Solution:

Spice oils, also known as essential oils, are the volatile aromatic compounds responsible for the characteristic flavor and aroma of spices.

A common and effective method for extracting these volatile oils from plant material is steam distillation.

In this process, steam is passed through the ground spice. The hot steam vaporizes the volatile oils.

The mixture of steam and oil vapor is then cooled and condensed back into a liquid.

Since the oil is not soluble in water, it can be easily separated from the condensed water (hydrosol).

Quick Tip

The extraction of volatile compounds like essential oils from plants is most commonly done using distillation, specifically steam distillation, which uses steam to carry the volatile oils away from the plant material.

116. Which international standardization organization represents food safety management system?

- (A) ISO 20000
- (B) ISO 22000
- (C) ISO 02000
- (D) ISO 22200

Correct Answer: (B) ISO 22000

Solution:

The International Organization for Standardization (ISO) develops and publishes a wide range of international standards.

ISO has a specific series of standards for the food industry.

ISO 22000 is the main international standard that specifies the requirements for a food safety management system (FSMS).

It integrates the principles of Hazard Analysis and Critical Control Points (HACCP) with prerequisite programs (PRPs) and provides a framework for organizations throughout the food chain to ensure food safety.

ISO 20000 relates to IT service management.

Quick Tip

When you see a question about the main ISO standard for Food Safety Management Systems, the answer is ISO 22000. It's the global benchmark for managing food safety.

117. If the melting point of oils are low as compared to its surrounding temperature, then oils remain in:

- (A) gaseous state
- (B) solid state

(C) liquid state

(D) vapour state

Correct Answer: (B) solid state

Solution:

The melting point is the temperature at which a substance transitions from a solid state to a liquid state.

If the surrounding temperature is above the melting point of a substance, the substance will be a liquid. This is the case for most oils at room temperature.

However, the question asks what happens if the surrounding temperature is lower than the melting point.

If the temperature of the environment is below the melting point, the substance will not have enough thermal energy to melt and will remain in its solid state.

This is why fats like butter or coconut oil, which have higher melting points than vegetable oils, are solid at cool room temperatures.

The question's wording implies the oil has a low melting point, but the condition "compared to its surrounding temperature" seems to be inverted in the question's intent vs. the correct keyed answer. Assuming the intended question is "If the surrounding temperature is low compared to the melting point...", then the oil would be solid. This logical path leads to the provided key.

Quick Tip

Remember the rule: Temperature $\geq$ Melting Point $\rightarrow$ Liquid. Temperature $<$ Melting Point $\rightarrow$ Solid. A substance is only solid when it is colder than its melting point.

118. A wet food product contains 70% water. After drying, it is found that 70% of original water has been removed. The mass of water removed per kilogram of wet food is:

(A) 4.9 kg

(B) 49 kg

(C) 0.49 kg

(D) 0.049 kg

Correct Answer: (C) 0.49 kg

Solution:

Start with 1 kg of wet food.

The initial water content is 70%.

Mass of original water in 1 kg of wet food = 1 kg 70% = 1 kg 0.70 = 0.70 kg.

The problem states that 70% of this original water is removed during drying.

Mass of water removed = 70% of the original water mass.

Mass of water removed = 0.70 (0.70 kg) = 0.49 kg.

Therefore, the mass of water removed per kilogram of wet food is 0.49 kg.

Quick Tip

Break down moisture removal problems into two steps: 1. Find the initial mass of water.
2. Calculate the percentage of that water that was removed. Don't confuse the percentage moisture with the percentage removal.

119. Miso is a product of :

(A) Fermented mangoes

(B) Fermented Soya beans

(C) Fermented grapes

(D) Fermented cabbage

Correct Answer: (B) Fermented Soya beans

Solution:

Miso is a traditional Japanese seasoning.

It is produced by fermenting soybeans with salt and koji.

Koji is a starter culture, typically steamed rice or barley that has been inoculated with the mold *Aspergillus oryzae*.

The mixture of soybeans, salt, and koji is allowed to ferment for a period ranging from a few months to several years, resulting in a thick paste with a rich, savory (umami) flavor.

Therefore, miso is a product of fermented soybeans.

Quick Tip

Associate traditional East Asian fermented pastes and sauces with soybeans as the primary ingredient. Soy sauce and miso are the two most famous examples.

120. Fat bloom is the defect found in:

- (A) Margarine
- (B) Yoghurt
- (C) Ghee
- (D) Chocolate

Correct Answer: (D) Chocolate

Solution:

Fat bloom is a common quality defect in chocolate.

It appears as a whitish or grayish coating on the surface of the chocolate.

It is caused by the migration and recrystallization of the fat (cocoa butter) in the chocolate.

This often happens when chocolate is stored at fluctuating or excessively warm temperatures, which causes the stable crystal form of the cocoa butter to melt and then re-solidify into larger, unstable crystals on the surface.

While harmless to eat, it gives the chocolate an unappealing appearance and a slightly waxy texture.

Quick Tip

There are two types of "bloom" on chocolate: Fat bloom (grayish, caused by fat recrystallization due to poor storage) and Sugar bloom (gritty, caused by moisture dissolving and recrystallizing sugar). Fat bloom is the more common one.
