TS PGECET Food Technology 29th May 2023 Shift2 Question Paper with Solutions

Time Allowed :2 Hours	**Maximum Marks :**120	**Total questions :**120

MATHEMATICS

1. The system of equations

$$\begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & 2 \\ 1 & 2 & a-4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 4 \\ a \end{bmatrix}$$

will have a unique solution for:

(1) $a = 8$

(2) $a \neq 8$

(3) $a \in \mathbb{R}$

(4) $a \in \mathbb{Z}$

Correct Answer: (2) $a \neq 8$

Solution:

Step 1: A system of linear equations has a unique solution if the determinant of its coefficient matrix is non-zero.

Step 2: Compute the determinant:

$$\begin{vmatrix} 1 & 2 & 4 \\ 2 & 1 & 2 \\ 1 & 2 & a-4 \end{vmatrix}$$

Step 3: Expand the determinant using the first row:

$$= 1 \begin{vmatrix} 1 & 2 \\ 2 & a-4 \end{vmatrix} - 2 \begin{vmatrix} 2 & 2 \\ 1 & a-4 \end{vmatrix} + 4 \begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}$$

Step 4: Simplify the minors:

$$= 1 \times (1 \times (a-4) - 2 \times 2) - 2 \times (2 \times (a-4) - 1 \times 2) + 4 \times (2 \times 2 - 1 \times 1)$$

$$= (a - 4 - 4) - 2 \times (2a - 8 - 2) + 4 \times (4 - 1)$$

$$= (a - 8) - 2 \times (2a - 10) + 4 \times 3$$

$$= a - 8 - (4a - 20) + 12$$

$$= a - 8 - 4a + 20 + 12$$

$$= -3a + 24$$

Step 5: For unique solution:

$$-3a + 24 \neq 0$$

$$\Rightarrow a \neq 8$$

Quick Tip

To check for unique solutions in a system of linear equations, always test if the determinant of the coefficient matrix is non-zero. A zero determinant means no or infinitely many solutions.

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2. If

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

satisfies the matrix equation

$$A^3 - 3A^2 + KA - 5I = 0$$

then $K =$

(1) -8

(2) 8

(3) -9

(4) 9

Correct Answer: (3) -9

Solution:

Step 1: Use the Cayley-Hamilton theorem: A square matrix satisfies its own characteristic equation.

Step 2: Find the characteristic equation of matrix A:

$$|A - \lambda I| = 0$$

$$= \begin{vmatrix} 1-\lambda & 2 & 2 \\ 2 & 1-\lambda & 2 \\ 2 & 2 & 1-\lambda \end{vmatrix}$$

Step 3: Expand the determinant:

$$= (1-\lambda)\left((1-\lambda)^2 - 4\right) - 2\left(2(1-\lambda) - 4\right) + 2\left(4 - 2(1-\lambda)\right)$$

Simplify:

$$= (1-\lambda)\left(\lambda^2 - 2\lambda - 3\right)$$

$$= (1-\lambda)(\lambda - 3)(\lambda + 1)$$

Step 4: So, characteristic equation:

$$(\lambda - 3)(\lambda - (-1))(\lambda - 1) = 0$$

Step 5: Therefore, the characteristic polynomial is:

$$\lambda^3 - 3\lambda^2 - 9\lambda - 5 = 0$$

Comparing with the given matrix equation:

$$A^3 - 3A^2 + KA - 5I = 0$$

We find that:

$$K = -9$$

Quick Tip

When a matrix satisfies a polynomial equation, use the Cayley-Hamilton theorem to equate the characteristic equation with the given equation and compare coefficients directly.

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3. The value of

$$\int_0^1 \frac{35x^3}{32\sqrt{1-x}}\,dx$$

is:

(1) 1

(2) 3

(3) $\frac{35}{32}$

(4) $\frac{32}{35}$

Correct Answer: (1) 1

Solution:

Step 1: Consider the given integral:

$$I = \int_0^1 \frac{35x^3}{32\sqrt{1-x}}\,dx$$

Step 2: Use the Beta function identity:

$$\int_0^1 x^{m-1}(1-x)^{n-1}\,dx = B(m,n)$$

where

$$B(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$$

Step 3: Compare:

$$\frac{35}{32}x^3(1-x)^{-\frac{1}{2}}$$

with

$$x^{m-1}(1-x)^{n-1}$$

We have: $m-1=3 \Rightarrow m=4$ $n-1=-\frac{1}{2} \Rightarrow n=\frac{1}{2}$

Step 4: Now apply the Beta function formula:

$$I=\frac{35}{32} \times B(4, \frac{1}{2})$$

Step 5: Use the Beta function value:

$$B(m, n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$$

and

$$\Gamma(4)=3!=6,\ \Gamma\left(\frac{1}{2}\right)=\sqrt{\pi},\ \Gamma\left(4+\frac{1}{2}\right)=\Gamma\left(\frac{9}{2}\right)$$

But it's better to use the property:

$$B(m, n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}=\frac{\Gamma(4)\Gamma(\frac{1}{2})}{\Gamma(\frac{9}{2})}$$

Using $\Gamma(\frac{9}{2})=\frac{105\sqrt{\pi}}{16}$

Now:

$$I=\frac{35}{32} \times \frac{6 \times \sqrt{\pi}}{\frac{105\sqrt{\pi}}{16}}=\frac{35}{32} \times \frac{6 \times 16}{105}=\frac{35}{32} \times \frac{96}{105}=\frac{3360}{3360}=1$$

Quick Tip

When integrating expressions of the form $x^m(1-x)^n$ over $[0, 1]$, consider using the Beta function for a quicker solution.

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4. The greatest value of the directional derivative of the function

$$f=\frac{x^3}{3}+y+z^2$$

at $(-1, 1, 1)$ **is:**

(1) $\sqrt{3}$

(2) $\sqrt{5}$

(3) $\sqrt{7}$

(4) $\sqrt{6}$

Correct Answer: (4) $\sqrt{6}$

Solution:

Step 1: The greatest value of the directional derivative at a point is the magnitude of the gradient vector at that point:

$$|\nabla f|$$

Step 2: Compute the gradient:

$$\nabla f = \left(\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}\right)$$
$$= (x^2, 1, 2z)$$

Step 3: Evaluate at $(-1, 1, 1)$:

$$\nabla f|_{(-1,1,1)} = (1, 1, 2)$$

Step 4: Find the magnitude:

$$|\nabla f| = \sqrt{1^2 + 1^2 + 2^2} = \sqrt{1 + 1 + 4} = \sqrt{6}$$

Quick Tip

The maximum value of the directional derivative at any point is simply the magnitude of the gradient vector at that point — no need to compute any direction vector.

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5. If a random variable has a Poisson distribution such that

$$P(X = 1) = P(X = 2),$$

then $P(X = 4)$ **is:**

(1) $\frac{1}{4}e^{-2}$

(2) $\frac{1}{3}e^{-2}$

(3) $\frac{2}{3}e^{-2}$

(4) e^{-2}

Correct Answer: (3) $\frac{2}{3}e^{-2}$

Solution:

Step 1: The Poisson probability formula is:

$$P(X = k) = \frac{e^{-\lambda}\lambda^k}{k!}$$

Step 2: Given $P(X = 1) = P(X = 2)$

$$\frac{e^{-\lambda}\lambda^1}{1!} = \frac{e^{-\lambda}\lambda^2}{2!}$$

Step 3: Simplify and solve for λ

$$\lambda = \frac{\lambda^2}{2}$$

$$\lambda^2 - 2\lambda = 0$$

$$\lambda(\lambda - 2) = 0$$

Since λ cannot be 0 for a Poisson distribution,

$$\lambda = 2$$

Step 4: Now, find $P(X = 4)$

$$P(X = 4) = \frac{e^{-2}2^4}{4!} = \frac{e^{-2} \times 16}{24} = \frac{2}{3}e^{-2}$$

Quick Tip

For Poisson distribution problems, use the standard probability formula carefully and equate probabilities as given in the question to find the unknown parameter.

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6. If the density function of continuous random variable X is given by

$$f(X = x) = \begin{cases} \frac{1}{\beta}e^{-\left(\frac{x}{\beta}\right)}, & x > 0 \\ 0, & \textbf{otherwise} \end{cases}$$

then the mean of the distribution is:

(1) $\frac{1}{\beta}$

(2) β

(3) β^2

(4) β^3

Correct Answer: (2) β

Solution:

This is the probability density function (pdf) of an exponential distribution:

$$f(x) = \frac{1}{\beta} e^{-x/\beta}, \quad x > 0$$

The mean (expected value) of an exponential distribution is:

$$E(X) = \beta$$

Hence, the mean of this distribution is β.

Quick Tip

For an exponential distribution with pdf $f(x) = \frac{1}{\beta} e^{-x/\beta}$, the mean is always β and variance is β^2.

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7. If $D^n = \frac{d^n}{dx^n}$ then

$$\frac{1}{D^2 + 9} \sin 3x =$$

(1) $\frac{-x}{6} \cos 3x$

(2) $\frac{x}{6} \cos 3x$

(3) $\frac{-x}{6} \sin 3x$

(4) $\frac{x}{6} \sin 3x$

Correct Answer: (1) $\frac{-x}{6} \cos 3x$

Solution:

We use the operator method for linear differential equations. Given:

$$\frac{1}{D^2 + 9} \sin 3x$$

Since $D^2 \sin 3x = -9 \sin 3x$, substitute:

$$= \frac{1}{-9 + 9} \sin 3x$$

But the denominator becomes zero, so apply the method of inverse operators for repeated roots:

$$= \frac{x}{2 \cdot 3} \cdot \frac{\cos 3x}{3} = \frac{-x}{6} \cos 3x$$

Quick Tip

When the auxiliary equation has a repeated root (like here $D^2 + 9 = 0$ for $\sin 3x$), use the method of inverse operators with an x multiplier to find a particular integral.

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8. The Laplace transform of $\left\{te^{2t} \sin 3t\right\}$ is:

(1) $\frac{s-2}{(s^2-4s+13)}$

(2) $\frac{s-2}{(s^2-4s+13)^2}$

(3) $\frac{6(s+2)}{(s^2-4s+13)^2}$

(4) $\frac{6(s-2)}{(s^2-4s+13)^2}$

Correct Answer: (4) $\frac{6(s-2)}{(s^2-4s+13)^2}$

Solution:

We use the formula:

$$\mathcal{L}\left\{te^{at} \sin bt\right\} = \frac{2b(s-a)}{\left[(s-a)^2 + b^2\right]^2}$$

Given:

$$a = 2,\ b = 3$$

Substituting:

$$= \frac{2 \times 3 \times (s-2)}{\left[(s-2)^2 + 9\right]^2}$$

Simplifying denominator:

$$(s-2)^2 + 9 = s^2 - 4s + 13$$

So final Laplace transform:

$$= \frac{6(s-2)}{(s^2 - 4s + 13)^2}$$

Quick Tip

Always remember to multiply by t in the Laplace transform formula increases the power of the denominator by 1 and multiplies the numerator by $2b$.

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9. If $\frac{dy}{dx} = x + y^2$, $y(0) = 1$, then by Picard's method the second approximation $y^{(2)}(x)$ is:

(1) $1 + x + \frac{3}{2}x^2$

(2) $1 + x + \frac{3}{2}x^2 + \frac{2}{3}x^3$

(3) $1 + x + \frac{3}{2}x^2 + \frac{2}{3}x^3 + \frac{x^4}{4} + \frac{x^5}{20}$

(4) $1 + x + \frac{3}{2}x^2 + \frac{2}{3}x^3 + \frac{x^4}{4} + \frac{x^5}{20} + \frac{x^6}{120}$

Correct Answer: (3) $1 + x + \frac{3}{2}x^2 + \frac{2}{3}x^3 + \frac{x^4}{4} + \frac{x^5}{20}$

Solution:

Picard's successive approximations:

$$y^{(0)}(x) = 1$$

$$y^{(1)}(x) = 1 + \int_0^x \left(t + 1^2\right) dt = 1 + \frac{x^2}{2} + x$$

$$y^{(2)}(x) = 1 + \int_0^x \left(t + \left(1 + t + \frac{t^2}{2}\right)^2\right) dt$$

Expanding and integrating term-by-term gives:

$$= 1 + x + \frac{3}{2}x^2 + \frac{2}{3}x^3 + \frac{x^4}{4} + \frac{x^5}{20}$$

Quick Tip

In Picard's method, each iteration integrates the function of x and the previous approximation, so remember to expand and integrate carefully.

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10. The Newton-Raphson iteration formula for finding $\sqrt[3]{20}$ is

(A) $x_{n+1} = \dfrac{2x_n^3 - 20}{3x_n^2}$

(B) $x_{n+1} = \dfrac{2x_n^3 + 20}{x_n^3}$

(C) $x_{n+1} = \dfrac{x_n^3 + 20}{3x_n^2}$

(D) $x_{n+1} = \dfrac{2x_n^3 + 20}{3x_n^2}$

Correct Answer: (D) $x_{n+1} = \dfrac{2x_n^3 + 20}{3x_n^2}$

Solution:

Step 1: Let $f(x) = x^3 - 20$. We want to find the cube root of 20, i.e., solve $f(x) = 0$.

Step 2: The Newton-Raphson formula is:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Step 3: Compute the derivative:

$$f'(x) = 3x^2$$

Step 4: Substitute into the formula:

$$x_{n+1} = x_n - \frac{x_n^3 - 20}{3x_n^2} = \frac{3x_n^3 - (x_n^3 - 20)}{3x_n^2} = \frac{2x_n^3 + 20}{3x_n^2}$$

Step 5: This matches option (D).

Quick Tip

For root-finding using Newton-Raphson, set $f(x) = 0$ and apply $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$. Use derivatives carefully.

Food Technology

11. Which of the following is an end compound of Strecker degradation?

(A) Acid

(B) Ester

(C) Aldehyde

(D) Ketone

Correct Answer: (C) Aldehyde

Solution:

Step 1: Strecker degradation involves the breakdown of amino acids in the presence of reducing sugars and heat.

Step 2: In this process, the amino group is removed, and the resulting compound is typically an **aldehyde**.

Step 3: Therefore, aldehydes are the end compounds formed in Strecker degradation.

Quick Tip

Remember: Strecker degradation ends with the formation of aldehydes — useful in flavor chemistry and amino acid degradation pathways.

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12. Rancidity is progressed through the formation of

(A) Free radicals

(B) Carbanions

(C) Carbocations

(D) Carbenes

Correct Answer: (A) Free radicals

Solution:

Step 1: Rancidity is the oxidation of fats and oils, especially unsaturated fatty acids.

Step 2: This process is initiated and propagated by **free radical chain reactions**.

Step 3: Free radicals react with oxygen, leading to peroxides and aldehydes, contributing to the unpleasant smell and taste.

Quick Tip

Oxidative rancidity is a free radical-driven process—think of free radicals as the culprits behind spoilage of fats.

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13. Flavour reversion in oils can be defined as

(A) Rancidity due to oxygen

(B) Rancidity caused due to reaction with water

(C) Flavour change before the onset of rancidity

(D) Rancidity caused due to fungi

Correct Answer: (C) Flavour change before the onset of rancidity

Solution:

Step 1: Flavour reversion refers to the early stage deterioration of edible oils and fats.

Step 2: It occurs **before rancidity**, involving minor chemical changes that affect taste and smell.

Step 3: It is not necessarily due to microbial or oxidative processes like true rancidity, but indicates initial degradation.

Quick Tip

Flavour reversion is a warning sign — it occurs before oils become rancid. Watch for taste changes even when spoilage isn't obvious.

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14. Linoleic acid is

(A) ω-2 fatty acid

(B) ω-3 fatty acid

(C) ω-4 fatty acid

(D) ω-6 fatty acid

Correct Answer: (D) ω-6 fatty acid

Solution:

Step 1: Linoleic acid is a polyunsaturated fatty acid with 18 carbon atoms and two double bonds.

Step 2: The first double bond occurs at the sixth carbon from the methyl (omega) end, classifying it as an ω-6 fatty acid.

Step 3: Omega-6 fatty acids are essential nutrients important for cellular function and inflammation regulation.

Quick Tip

To identify omega fatty acids, count from the methyl end to the first double bond. Linoleic acid's first bond is at position 6 $\rightarrow$ ω-6.

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15. The product of heating sugar above its melting point in acidic condition is

(A) Fructose

(B) Caramel

(C) Amylose

(D) Glyoxalates

Correct Answer: (B) Caramel

Solution:

Step 1: When sugar is heated above its melting point, especially under acidic conditions, it undergoes decomposition.

Step 2: This leads to a process known as caramelization, producing a brown, sticky substance called caramel.

Step 3: Other options such as fructose or amylose are unrelated to this thermal degradation process.

Quick Tip

Caramel is formed from sugar when heated — not a new sugar like fructose, but a breakdown product with a brown color and distinct aroma.

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16. Raffinose is made up of

(A) Mannose, glucose and galactose

(B) Mannose, fructose and galactose

(C) Glucose, fructose and galactose

(D) Glucose, fructose and sucrose

Correct Answer: (C) Glucose, fructose and galactose

Solution:

Step 1: Raffinose is a trisaccharide made up of three monosaccharides: galactose, glucose, and fructose.

Step 2: Structurally, it consists of a galactose unit joined to a sucrose molecule (which is glucose + fructose).

Step 3: Therefore, the correct composition is glucose, fructose, and galactose.

Quick Tip

Remember: raffinose = galactose + sucrose $\rightarrow$ and sucrose = glucose + fructose.

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17. Scurvy is a disease caused due to deficiency of

(A) Vitamin A

(B) Vitamin C

(C) Vitamin K

(D) Vitamin D

Correct Answer: (B) Vitamin C

Solution:

Step 1: Scurvy is a condition that results from a prolonged deficiency of Vitamin C (ascorbic acid).

Step 2: Vitamin C is essential for collagen synthesis, and its absence weakens connective tissues, leading to symptoms like bleeding gums, weakness, and joint pain.

Step 3: Hence, Vitamin C deficiency is the correct cause of scurvy.

Quick Tip

Scurvy = Vitamin C deficiency. Think: C for Collagen, C for Citrus — both linked to Vitamin C!

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18. Vitamin K naturally occurs as

(A) Phylloquinone

(B) Menaquinone

(C) Napthoquinone

(D) Cystoquinone

Correct Answer: (A) Phylloquinone

Solution:

Step 1: Vitamin K exists primarily in two natural forms: Vitamin K_1 (Phylloquinone) and Vitamin K_2 (Menaquinone).

Step 2: Phylloquinone is the main form found in plants and is the primary dietary source.

Step 3: Therefore, the naturally occurring form of Vitamin K in most diets is Phylloquinone.

Quick Tip

Vitamin K from leafy greens = Phylloquinone (K_1). Remember: "Phyto" = plants!

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19. Zinc decreases the bioavailability of

(A) Calcium

(B) Magnesium

(C) Copper

(D) Iron

Correct Answer: (C) Copper

Solution:

Step 1: Zinc and copper compete for absorption in the gastrointestinal tract.

Step 2: High levels of zinc induce the synthesis of metallothionein, a protein that binds copper and prevents its absorption.

Step 3: Therefore, increased zinc intake reduces the bioavailability of copper.

Quick Tip

Remember: Excessive zinc intake can lead to copper deficiency due to competitive absorption.

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20. Chemically Annatto is

(A) Carotenoids

(B) Flavonoids

(C) Heme Pigment

(D) Pheaols

Correct Answer: (A) Carotenoids

Solution:

Step 1: Annatto is a natural food coloring derived from the seeds of the achiote tree.

Step 2: Its primary pigments are bixin and norbixin, which are carotenoids.

Step 3: Thus, chemically, annatto is classified under carotenoids.

Quick Tip

Think of Annatto as a plant-based colorant rich in carotenoids like bixin — not a flavonoid!

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21. After removal of Mg ion from chlorophyll the compound formed is

(A) Heptochlorophyll

(B) Pheophytin

(C) Chlorophillide

(D) Mesochlorophyl

Correct Answer: (B) Pheophytin

Solution:

Step 1: Chlorophyll contains a central magnesium ion in its porphyrin ring.

Step 2: When Mg^{2+} is removed from chlorophyll, the resulting compound is pheophytin.

Step 3: Pheophytin is a magnesium-free derivative that plays a role in photosynthesis as an electron carrier.

Quick Tip

Think: Mg^{2+} removal from chlorophyll always gives pheophytin — a key intermediate in electron transport.

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22. The number of amino acids per turn of helical structure is

(A) 3.0

(B) 3.2

(C) 3.6

(D) 4.0

Correct Answer: (C) 3.6

Solution:

Step 1: The alpha-helix is a common structural motif in proteins.

Step 2: Each full turn of the alpha-helix consists of approximately 3.6 amino acid residues.

Step 3: This structure is stabilized by hydrogen bonding between the N-H of one amino acid and the C=O of another four residues earlier.

Quick Tip

Remember the magic number: 3.6 amino acids per turn in an alpha-helix structure.

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23. Propyl gallate is used in Fat / Oil processing as

(A) Plasticizer

(B) Emulsifier

(C) Synergistic

(D) Antioxidant

Correct Answer: (D) Antioxidant

Solution:

Step 1: Propyl gallate is a type of phenolic antioxidant.

Step 2: It is commonly added to edible oils and fats to prevent oxidation.

Step 3: This helps in extending shelf life and preserving food quality by preventing rancidity.

Quick Tip

Remember: Propyl gallate = antioxidant used to prevent oxidation in oils/fats.

24. Biuret test is for the qualitative analysis of

(A) Reducing Sugar

(B) Proteins

(C) Saturated fatty acid

(D) Vitamin A

Correct Answer: (B) Proteins

Solution:

Step 1: The Biuret test is used to detect peptide bonds.

Step 2: Proteins contain peptide bonds, which react with copper(II) ions in alkaline conditions to give a violet/purple complex.

Step 3: The appearance of a violet color confirms the presence of proteins.

Quick Tip

Biuret test = Protein test. Violet color = Peptide bonds detected.

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25. Cobalamin is known as

(1) Vitamin B-1

(2) Vitamin B-2

(3) Vitamin B-6

(4) Vitamin B-12

Correct Answer: (4) Vitamin B-12

Solution:

Step 1: Cobalamin is the scientific name for Vitamin B-12.

Step 2: It plays a crucial role in red blood cell formation, neurological function, and DNA synthesis.

Step 3: Deficiency of Vitamin B-12 can cause megaloblastic anemia.

Quick Tip

Cobalamin = Vitamin B-12. Important for red blood cells and nerve health.

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26. The logarithmic order of death for bacterial population is described by

(1) Decimal reduction time

(2) Death rate curve

(3) Death Production curve

(4) Death reduction curve

Correct Answer: (2) Death rate curve

Solution:

Step 1: A death rate curve plots the logarithmic decline in the number of viable microorganisms over time.

Step 2: It is used to study microbial inactivation kinetics during food processing and sterilization.

Step 3: This curve helps determine appropriate processing times for microbial safety.

Quick Tip

Logarithmic microbial death $\rightarrow$ described by the death rate curve.

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27. The food product which is like soft cheese made by curdling fresh hot soya milk with coagulant is

(1) Tofu

(2) Tempeh

(3) Cheddar cheese

(4) Paneer

Correct Answer: (1) Tofu

Solution:

Step 1: Tofu is made by curdling fresh hot soya milk, typically using a coagulant like calcium sulfate or magnesium chloride.

Step 2: This process is similar to how cheese is made from dairy milk, resulting in a soft, cheese-like product.

Step 3: Tempeh and paneer differ in source and method, while cheddar is a fermented dairy product.

Quick Tip

Tofu = Soya milk + coagulant $\rightarrow$ curdled into soft cheese-like texture.

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28. Cheddar cheese is manufactured using lipase extracted from

(1) Penicillium camemberti

(2) Kid pre-gastric lipase

(3) Aspergillus niger

(4) Lamb pre-gastric lipase

Correct Answer: (3) Aspergillus niger

Solution:

Step 1: Lipases are enzymes that hydrolyze fats and are used in cheese manufacturing for flavor development.

Step 2: In cheddar cheese production, microbial lipases from *Aspergillus niger* are commonly used due to their efficiency and non-animal origin.

Step 3: Animal lipases (kid/lamb) are used in some cheeses but not typically in cheddar.

Quick Tip

Cheddar cheese $\rightarrow$ uses microbial lipase from *Aspergillus niger*.

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29. Which of the following acid will have higher bacteriostatic effect at a given pH

(1) Acetic acid

(2) Tartaric acid

(3) Citric acid

(4) Maleic acid

Correct Answer: (1) Acetic acid

Solution:

Step 1: Bacteriostatic effect depends on the undissociated acid form at a specific pH.

Step 2: Acetic acid remains more undissociated and thus penetrates microbial membranes effectively.

Step 3: This enhances its ability to inhibit microbial growth compared to other listed acids.

Quick Tip

More undissociated acid at given pH → Stronger bacteriostatic effect (e.g., Acetic acid).

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30. Which of the following is not true for the thermal resistance of the bacterial cells?

(1) Cocci are usually more resistant than rods

(2) Higher the optimal and maximal temperatures for growth, higher the resistance

(3) Bacteria that clump considerably or form capsules are difficult to kill

(4) Cells low in lipid content are harder to kill than other cells

Correct Answer: (1) Cocci are usually more resistant than rods

Solution:

Step 1: Rod-shaped bacteria, especially spore-forming types, tend to be more heat resistant.

Step 2: Cocci are generally less thermally resistant than rods.

Step 3: Statements (2), (3), and (4) are true and supported by microbial heat resistance principles.

Quick Tip

Cocci are generally less heat resistant than rods — opposite of what's stated.

31. Yeast and mould count determination requires

(1) Nutrient agar

(2) Acidified potato glucose agar

(3) MacConkey agar

(4) Violet Red Bile agar

Correct Answer: (2) Acidified potato glucose agar

Solution:

Step 1: Yeast and molds prefer acidic conditions for growth.

Step 2: Acidified potato glucose agar is a selective medium with low pH that favors fungi over bacteria.

Step 3: Other media like MacConkey and VRBA are selective for bacteria, not fungi.

Quick Tip

Acidified media like potato glucose agar → ideal for fungal (yeast and mold) counts.

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32. The time temperature combination for HTST pasteurization at 71.1°C for 15 sec is selected on the basis of

(1) Coxiella burnetii

(2) E. coli

(3) Subtilis

(4) Botulinum

Correct Answer: (1) Coxiella burnetii

Solution:

Step 1: HTST (High Temperature Short Time) pasteurization targets the most heat-resistant non-spore-forming pathogen.

Step 2: *Coxiella burnetii*, the causative agent of Q-fever, is that organism.

Step 3: Eliminating *C. burnetii* ensures safety against other less heat-resistant pathogens.

Quick Tip

HTST pasteurization → based on killing *Coxiella burnetii*.

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33. Microorganisms used in biotechnology primarily shall not

(1) Grow rapidly in cheap culture medium

(2) be readily manipulated

(3) be pathogenic

(4) be omnipotent

Correct Answer: (3) be pathogenic

Solution:

Step 1: Ideal biotech microbes must be safe and non-pathogenic to ensure safe handling.

Step 2: Traits like fast growth, low-cost media, and manipulability are desirable.

Step 3: Pathogenicity poses safety risks in industrial and research applications.

Quick Tip

Biotech microbes → should be safe (non-pathogenic), easy to grow and modify.

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34. Fermentation is

(1) An aerobic process of converting sugars into alcohols or acids and carbon dioxide

(2) An aerobic process of converting sugars into alcohols or acids and Oxygen

(3) An anaerobic process of converting sugars into alcohols or acids and oxygen

(4) An anaerobic process of converting sugars into alcohols or acids and carbon dioxide

Correct Answer: (4) An anaerobic process of converting sugars into alcohols or acids and carbon dioxide

Solution:

Step 1: Fermentation occurs in the absence of oxygen (anaerobic conditions).

Step 2: Microorganisms convert sugars into alcohols (e.g., ethanol) or acids (e.g., lactic acid).

Step 3: Carbon dioxide is often a by-product in many fermentative processes.

Quick Tip

Fermentation = Anaerobic conversion of sugar $\rightarrow$ alcohol/acid + CO_2.

---

35. Cider is the product obtained from

(1) Fermentation of plum

(2) Fermentation of Peach

(3) Fermentation of Apple

(4) Distillation of wine

Correct Answer: (3) Fermentation of Apple

Solution:

Step 1: Cider is an alcoholic beverage derived from apples.

Step 2: It is made by fermenting apple juice using yeast.

Step 3: Other fruits like plum or peach are not typically used for cider.

Quick Tip

Cider = Fermented apple juice.

---

36. Separating the outer hull from inner hull is called

(1) Tulling

(2) Dehulling

(3) Shelling

(4) Beating

Correct Answer: (2) Dehulling

Solution:

Step 1: Dehulling is the process of removing the outer husk from grains or seeds.

Step 2: It improves digestibility and processing quality.

Step 3: Commonly used in legumes, millets, and oilseeds.

Quick Tip

Dehulling = Removing outer husk from seeds/grains.

---

37. Which of the following bioactive component is rich in Oats?

(1) β-Glucan

(2) Glutamic acid

(3) β-Glucose

(4) α-Amylase

Correct Answer: (1) β-Glucan

Solution:

Step 1: Oats are known for high β-glucan content, a soluble fiber.

Step 2: It helps lower cholesterol and supports heart health.

Step 3: Other options are either amino acids or enzymes not specifically abundant in oats.

Quick Tip

Oats = Rich in β-glucan $\rightarrow$ key dietary fiber with heart benefits.

---

38. Which of the following moisture content is considered safe for storage of food grains?

(1) 15%

(2) 14%

(3) 16%

(4) 17%

Correct Answer: (2) 14%

Solution:

Step 1: Safe grain storage requires moisture content low enough to inhibit microbial and insect growth.

Step 2: 14% or lower is considered ideal for most cereals.

Step 3: Higher moisture levels promote spoilage and aflatoxin development.

Quick Tip

Safe storage moisture for grains = 14%.

---

39. Parboiling of rice originated from?

(1) Bhutan

(2) India

(3) Nepal

(4) USA

Correct Answer: (2) India

Solution:

Step 1: Parboiling is a hydrothermal process applied to paddy before milling.

Step 2: The process was historically developed in the Indian subcontinent.

Step 3: It improves nutritional content and reduces grain breakage during milling.

Quick Tip

India is the origin of the rice parboiling process.

---

40. Indian Institute of Wheat and Barley is situated in

(1) Ghaziabad, Uttar Pradesh

(2) Bhubaneswar, Odisha

(3) Dharwad, Karnataka

(4) Karnal, Haryana

Correct Answer: (4) Karnal, Haryana

Solution:

Step 1: The Indian Institute of Wheat and Barley Research (IIWBR) is a premier institution under ICAR.

Step 2: It is located in Karnal, Haryana.

Step 3: It conducts advanced research and development in wheat and barley improvement and production.

Quick Tip

IIWBR is located in Karnal, Haryana — focus: wheat barley R&D.

---

41. The oil, which experiences flavor reversion even at the lower peroxide value is

(1) Mustard

(2) Soybean

(3) Palm

(4) Sesame

Correct Answer: (2) Soybean

Solution:

Step 1: Flavor reversion is the development of off-flavors in edible oils even at low levels of oxidation.

Step 2: Soybean oil is particularly prone to this, even at low peroxide values.

Step 3: This makes flavor stability a key challenge in soybean oil processing and storage.

Quick Tip

Soybean oil undergoes flavor reversion at low peroxide values.

---

42. What treatment should be given to pulses which are hard to dehusk?

(1) Soak with hot water

(2) Apply red earth

(3) Soak with cold water

(4) Apply black soil

Correct Answer: (2) Apply red earth

Solution:

Step 1: Pulses that are difficult to dehusk are treated before milling to improve husk removal.

Step 2: Applying red earth helps loosen the husk.

Step 3: This traditional method enhances milling efficiency and reduces losses.

Quick Tip

Apply red earth to ease dehusking of hard pulses.

---

43. What is the drying temperature of pulses in mechanically heated air dryers?

(1) 26–48C

(2) 60–120C

(3) 80–135C

(4) 100–120C

Correct Answer: (2) 60–120C

Solution:

Step 1: Mechanical air dryers are used for controlled drying of pulses.

Step 2: The recommended drying temperature range is 60–120°C to prevent damage and preserve quality.

Step 3: Proper drying improves shelf life and milling performance.

Quick Tip

Pulse drying in air dryers: 60–120°C is optimal.

---

44. Yellow Revolution is related to _____.

(1) Oilseed production

(2) Fish production

(3) Paddy production

(4) Pulse production

Correct Answer: (1) Oilseed production

Solution:

Step 1: The Yellow Revolution in India focused on increasing oilseed production.

Step 2: It aimed at achieving self-sufficiency in edible oils.

Step 3: It paralleled the Green and White revolutions in its impact on agriculture.

Quick Tip

Yellow Revolution = Oilseed boom in India.

---

45. Pitambari is a variety of ___.

(1) Wheat

(2) Mustard

(3) Gram

(4) Paddy

Correct Answer: (2) Mustard

Solution:

Step 1: Pitambari is a popular cultivar known for its high yield.

Step 2: It belongs to the mustard group of oilseeds.

Step 3: It is widely cultivated in India.

Quick Tip

Pitambari is a mustard variety.

---

46. The delayed bitterness of citrus fruit juices is due to

(1) Turpentine

(2) Peroxide

(3) Limonin

(4) Phenol

Correct Answer: (3) Limonin

Solution:

Step 1: Limonin is a bitter compound found in citrus fruits.

Step 2: It develops slowly after juice extraction, causing delayed bitterness.

Step 3: This compound is especially prevalent in oranges and lemons.

Quick Tip

Limonin causes delayed bitterness in citrus juices.

---

47. Which of the following is commonly used preservative in tomato sauce?

(1) Sulphur-di-oxide

(2) Salicylic acid

(3) Potassium sorbate

(4) Sodium benzoate

Correct Answer: (4) Sodium benzoate

Solution:

Step 1: Preservatives are used to extend the shelf life of food.

Step 2: Sodium benzoate is a widely used preservative in acidic foods like tomato sauce.

Step 3: It inhibits the growth of bacteria, yeast, and fungi.

Quick Tip

Sodium benzoate is the standard preservative in tomato sauce.

---

48. Sticking of powder to wall of the chamber during spray drying of fruit juice is due to

(1) Low glass transition temperature of the compounds in juice

(2) High glass transition temperature of the compounds in juice

(3) Improper processing parameters of spray dryer

(4) Presence of gums in feed material

Correct Answer: (1) Low glass transition temperature of the compounds in juice

Solution:

Step 1: During spray drying, juice solids with low glass transition temperature tend to become sticky.

Step 2: This causes powder to adhere to the dryer walls.

Step 3: Proper formulation and carriers help mitigate this issue.

Quick Tip

Low glass transition temperature leads to wall sticking in spray drying.

---

49. Which of the following term explains, blanching influences vegetable tissues?

(1) Enzymes production

(2) Alteration of cytoplasmic membrane

(3) Stabilization of cytoplasmic proteins

(4) Stabilization of nuclear proteins

Correct Answer: (2) Alteration of cytoplasmic membrane

Solution:

Step 1: Blanching causes physical changes in tissues.

Step 2: This includes alteration of cytoplasmic membranes to inactivate enzymes.

Quick Tip

Blanching alters cytoplasmic membranes in vegetables.

50. Which of the following is an oil soluble pigment present in fruits and vegetables?

(1) Flavonoids

(2) Carotenoids

(3) Anthocyanins

(4) Tannins

Correct Answer: (2) Carotenoids

Solution:

Step 1: Carotenoids are lipid-soluble pigments.

Step 2: They are responsible for red, yellow, and orange coloration in produce.

Quick Tip

Carotenoids are oil soluble pigments in fruits veggies.

---

51. Which of the following vegetable consumption could significantly reduce the chances of atherosclerosis

(1) USFA (Unsaturated Fatty acids)

(2) SFA (Saturated Fatty acids)

(3) Waxes

(4) SCFA (Short Chain Fatty acids)

Correct Answer: (1) USFA (Unsaturated Fatty acids)

Solution:

Step 1: Unsaturated fats help lower LDL cholesterol levels.

Step 2: This reduces the risk of arterial blockage and atherosclerosis.

Quick Tip

USFAs are heart-friendly and reduce atherosclerosis risk.

52. What is the Temperature and Time required for the Sterilization of Fruits and acidic vegetables like tomato?

(1) 100C for 30 minutes

(2) 100C for 1 minute

(3) 65C for 15 minutes

(4) 140F for 10 minutes

Correct Answer: (1) 100C for 30 minutes

Solution:

Step 1: Acidic foods require lower sterilization temperature.

Step 2: 100C for 30 minutes ensures safety and shelf stability.

Quick Tip

Sterilize acidic vegetables at 100°C for 30 minutes.

---

53. Which of the following statements is NOT TRUE in case of oxidative rancidity of vegetable oils and fats?

(1) It is caused by the reaction of saturated fatty acids and oxygen

(2) It involves polymerization of fatty acids

(3) It is caused by the reaction of unsaturated fatty acids with oxygen

(4) It is caused by reaction of proteins and oxygen

Correct Answer: (4) It is caused by reaction of proteins and oxygen

Solution:

Step 1: Oxidative rancidity primarily involves unsaturated fatty acids.

Step 2: Proteins are not involved in this process; hence the statement is incorrect.

Quick Tip

Oxidative rancidity affects unsaturated fats, not proteins.

54. Enzyme used for clarification of fruit juice is

(1) Pectinase

(2) Protease

(3) Cellulase

(4) Xylanase

Correct Answer: (1) Pectinase

Solution:

Step 1: Pectinase breaks down pectin, a structural polysaccharide in fruit cell walls.

Step 2: This reduces viscosity and leads to clearer juice.

Quick Tip

Pectinase helps clarify fruit juice by breaking pectin.

---

55. Name the alkaloid toxicant present in potato

(1) Piperine

(2) Cocaine

(3) Capsaicin

(4) Solanine

Correct Answer: (4) Solanine

Solution:

Step 1: Solanine is a naturally occurring toxic alkaloid found in potatoes.

Step 2: It can accumulate when potatoes are exposed to light.

Quick Tip

Solanine is the toxic alkaloid found in potatoes.

---

56. Rancidity in meat is due to spoilage by which of the following microorganisms?

(1) Bacillus

(2) Molda

(3) E. Coli

(4) Pseudomonas

Correct Answer: (4) Pseudomonas

Solution:

Step 1: Pseudomonas species are known for spoiling meat through oxidative rancidity.

Step 2: They produce off-flavors and slime, especially under aerobic conditions.

Quick Tip

Pseudomonas causes rancidity and spoilage in meat.

---

57. The enzymes which play an important role in ageing of meat, are ____ and ____.

(1) Calpains and Lyzozyme

(2) Protease and Cathepsins

(3) Calpains and Cathepsins

(4) Cathepsins and Trypsins

Correct Answer: (3) Calpains and Cathepsins

Solution:

Step 1: Calpains and Cathepsins are proteolytic enzymes.

Step 2: They contribute to the breakdown of muscle proteins, improving meat tenderness during ageing.

Quick Tip

Calpains and Cathepsins help tenderize meat during ageing.

---

58. Surface slime, stinkers, whiskers and black spot in meat are types of _____ spoilage.

(1) Anaerobic

(2) Aerobic

(3) Mold

(4) Fungal

Correct Answer: (2) Aerobic

Solution:

Step 1: Surface defects like slime and whiskers in meat typically occur due to aerobic bacterial activity.

Step 2: These microbes thrive in oxygen-rich environments causing visible spoilage.

Quick Tip

Surface meat spoilage like slime and stinkers is aerobic.

---

59. Rigor mortis is caused due to _____.

(1) Rupturing of tissue due to unavailability of oxygen

(2) Decrease in body temperature

(3) Breakage of rigid protein molecules in sarcoplasm

(4) Unavailability of ATP which is necessary to break the link between actin and myosin

Correct Answer: (4) Unavailability of ATP which is necessary to break the link between actin and myosin

Solution:

Step 1: After death, ATP synthesis stops.

Step 2: Lack of ATP prevents the detachment of actin and myosin filaments, causing stiffness.

Quick Tip

Rigor mortis occurs due to lack of ATP postmortem.

60. Nitrate and Nitrite along with Sodium Chloride are used in meat is called

(1) Curing agent

(2) Emulsifier

(3) Anti caking agent

(4) Fumigating agent

Correct Answer: (1) Curing agent

Solution:

Step 1: Nitrate and nitrite help in preserving meat and enhancing its flavor.

Step 2: When combined with salt, they form curing agents used in meat processing.

Quick Tip

Nitrate + Nitrite + Salt = Curing agents in meat.

---

61. Which of the following chemicals are used to preserve dark coloured foods?

(1) Sodium nitrate

(2) Sodium nitrite

(3) Sodium chloride

(4) Sodium benzoate

Correct Answer: (4) Sodium benzoate

Solution:

Step 1: Sodium benzoate is a common preservative.

Step 2: It is especially effective in preserving acidic and dark-colored foods such as fruit juices, pickles, and sauces.

Quick Tip

Sodium benzoate is widely used for preserving dark, acidic foods.

62. Boar taint is an issue faced by pork industry. This taint is due to the accumulation of

(1) High glucose in blood

(2) Androstenone and skatole

(3) Thamnidium spp

(4) Jhatka method of slaughtering

Correct Answer: (2) Androstenone and skatole

Solution:

Step 1: Boar taint is an unpleasant odor or taste in pork from non-castrated male pigs.

Step 2: It is primarily caused by the accumulation of androstenone and skatole in fat tissues.

Quick Tip

Boar taint = Androstenone + Skatole buildup in male pigs.

---

63. Deposition of fat within the lean muscle is called

(1) Curing

(2) Homogenization

(3) Marbling

(4) Rigor mortis

Correct Answer: (3) Marbling

Solution:

Step 1: Marbling refers to the intramuscular fat deposits visible in meat cuts.

Step 2: This fat enhances flavor, juiciness, and tenderness of meat.

Quick Tip

Marbling = Intramuscular fat $\rightarrow$ Better taste and tenderness.

64. Demersal fish are found in

(1) Middle and surface water layers of sea

(2) Bottom water layers of sea

(3) Only in fresh water

(4) Only in ponds

Correct Answer: (2) Bottom water layers of sea

Solution:

Step 1: Demersal fish are bottom dwellers in marine environments.

Step 2: They typically live near or on the seabed, such as cod and haddock.

Quick Tip

Demersal fish = Bottom-dwelling sea fish.

---

65. Trimethylamine oxide present in marine fish helps in

(1) Avoiding rigor mortis

(2) Osmoregulation

(3) Floating

(4) Hardening

Correct Answer: (2) Osmoregulation

Solution:

Step 1: Trimethylamine oxide (TMAO) is found in marine organisms.

Step 2: It helps maintain osmotic balance in the cells under high salt concentrations.

Quick Tip

TMAO = Osmoregulation in marine fish.

---

66. Which of the following exists only in milk

(1) Milk sugar

(2) Minerals

(3) Cholestrol

(4) Enzymes

Correct Answer: (1) Milk sugar

Solution:

Step 1: Milk sugar refers to lactose, a disaccharide found only in milk and dairy products.

Step 2: Other options (minerals, cholesterol, enzymes) are found in various other foods.

Quick Tip

Milk sugar = Lactose $\rightarrow$ Only found in milk.

---

67. Ultra high temperature pasteurization is operated at

(1) 150–160 °C for 10–15 Sec

(2) 135–150 °C for 1–8 Sec

(3) 150–170 °C for 15–20 Sec

(4) 168–175 °C for 20–28 Sec

Correct Answer: (2) 135–150 °C for 1–8 Sec

Solution:

Step 1: UHT (Ultra-High Temperature) pasteurization rapidly heats milk to 135–150°C.

Step 2: The short exposure time (1–8 seconds) kills microbes while preserving quality.

Quick Tip

UHT = 135–150°C for 1–8 seconds.

---

68. The sequence for homogenized milk in India

(1) Clarification, Preheating, Homogenization, Pasteurization, Cooling

(2) Clarification, Preheating, Pasteurization, Homogenization, Cooling

(3) Preheating, Homogenization, Clarification, Pasteurization, Cooling

(4) Preheating, Clarification, Homogenization, Pasteurization, Cooling

Correct Answer: (3) Preheating, Homogenization, Clarification, Pasteurization, Cooling

Solution:

Step 1: In India, the process of preparing homogenized milk follows a fixed sequence.

Step 2: Proper order ensures quality and safety: Preheating → Homogenization → Clarification → Pasteurization → Cooling.

Quick Tip

Process = Preheat → Homogenize → Clarify → Pasteurize → Cool

---

69. As per PFA, double toned milk contains minimum

(1) 3.0% fat & 8.5% SNF

(2) 4.0% fat & 9.0% SNF

(3) 1.5% fat & 9.0% SNF

(4) 1.5% fat & 8.5% SNF

Correct Answer: (3) 1.5% fat & 9.0% SNF

Solution:

Step 1: According to PFA (Prevention of Food Adulteration Act), double toned milk must meet specific minimum standards.

Step 2: It must contain at least 1.5% fat and 9.0% solids-not-fat (SNF).

Quick Tip

Double toned milk = 1.5% fat + 9.0% SNF (PFA standard)

---

70. The temperature of cream at churning is

(1) 9–11 °C

(2) 16–20 °C

(3) 11–15 °C

(4) 12–17 °C

Correct Answer: (1) 9–11 °C

Solution:

Step 1: Churning temperature affects fat globule aggregation and butter formation.

Step 2: Optimal churning temperature is 9–11 °C to ensure proper phase inversion and butter yield.

Quick Tip

Ideal churning temperature = 9–11 °C

---

71. The temperature of commercial cold storage of butter is

(1) 9–11 °C

(2) 16–20 °C

(3) 11–15 °C

(4) 12–17 °C

Correct Answer: (2) 16–20 °C

Solution:

Step 1: Butter requires a specific temperature range for commercial cold storage to maintain quality.

Step 2: The recommended storage range is 16–20 °C to prevent spoilage and rancidity.

Quick Tip

Butter cold storage temperature = 16–20 °C

---

72. As per PFA, moisture and fat content of whole milk powder is

(1) 5% of Moisture and not less than 26% fat

(2) 6% of Moisture and not less than 28% fat

(3) 5% of Moisture and not less than 35% fat

(4) 6% of Moisture and not less than 32% fat

Correct Answer: (1) 5% of Moisture and not less than 26% fat

Solution:

Step 1: The Prevention of Food Adulteration (PFA) rules specify the quality standards for dairy products.

Step 2: For whole milk powder, maximum 5% moisture and minimum 26% fat is mandatory.

Quick Tip

Whole milk powder (PFA) = Max 5% moisture & Min 26% fat

---

73. The largest Ghee producing state is

(1) West Bengal

(2) Maharashtra

(3) Uttar Pradesh

(4) Himachal Pradesh

Correct Answer: (3) Uttar Pradesh

Solution:

Step 1: Ghee production in India is highest in states with significant dairy activities.

Step 2: Uttar Pradesh has the largest milk production and hence leads in ghee output.

Quick Tip

Largest ghee producing state = Uttar Pradesh

---

74. Which among the following is the best cheese in the world?

(1) Cheddar cheese

(2) Cottage Cheese

(3) Processed Cheese

(4) Table Cheese

Correct Answer: (1) Cheddar cheese

Solution:

Step 1: Cheddar cheese is widely acclaimed for its flavor, texture, and global popularity.

Step 2: It is considered one of the best and most consumed cheeses in the world.

Quick Tip

Globally popular top cheese = Cheddar cheese

---

75. The pH for normal, fresh cow milk is

(1) 6.4 to 6.6%

(2) 6.7 to 6.8%

(3) 6.9 to 7.2%

(4) 6.3 to 6.5%

Correct Answer: (1) 6.4 to 6.6%

Solution:

Step 1: The natural pH of fresh cow milk is slightly acidic.

Step 2: The acceptable pH range is 6.4 to 6.6 for healthy milk.

Quick Tip

Normal cow milk pH: 6.4 to 6.6

---

76. Which greenhouse gas is produced by rotten food waste in landfill?

(1) Carbon Dioxide

(2) Nitrous oxide

(3) Methane

(4) Chlorofluorocarbons

Correct Answer: (3) Methane

Solution:

Step 1: Food waste decomposes anaerobically in landfills.

Step 2: This anaerobic decomposition produces methane, a potent greenhouse gas.

Quick Tip

Rotten food waste $\rightarrow$ Anaerobic decay $\rightarrow$ Methane

---

77. Process of burning of non-biodegradable solid waste is called _____

(1) Composting

(2) Sedimentation

(3) Segregation

(4) Incineration

Correct Answer: (4) Incineration

Solution:

Step 1: Non-biodegradable waste cannot be decomposed naturally.

Step 2: Such waste is burned at high temperatures in incinerators.

Quick Tip

Incineration = Burning of non-biodegradable solid waste

---

78. Flotation is a unit operation, used in waste water treatment to

1. Remove the lighter suspended solids

2. Concentrate biological sludge

3. Remove oil and grease

4. Remove the temporary hardness of the water

Choose the correct answer from the options given below:

(1) 1, 2 and 3 only

(2) 2, 3 and 4 only

(3) 1, 2 and 4 only

(4) 1, 2, 3 and 4

Correct Answer: (1) 1, 2 and 3 only

Solution:

Step 1: Flotation is effective for separating light particles.

Step 2: It helps concentrate sludge and remove oil/grease.

Step 3: It does **not** remove hardness, which requires chemical treatment.

Quick Tip

Flotation = Removes suspended solids, sludge, oil/grease — not water hardness

---

79. Among the following elements which is typically the most abundant in dried sewage sludge?

(1) Total nitrogen

(2) Total sulphur

(3) Calcium

(4) Total phosphorous

Correct Answer: (3) Calcium

Solution:

Step 1: Dried sewage sludge consists of various elements including metals and nutrients.

Step 2: Among them, calcium is typically the most abundant due to lime and other calcium-containing compounds used in treatment.

Quick Tip

Calcium is the dominant element in dried sewage sludge due to treatment additives.

---

80. Biomedical waste management is done by

(1) Bar screen

(2) Filtration

(3) Aeration

(4) Chlorination

Correct Answer: (1) Bar screen

Solution:

Step 1: Biomedical waste often contains large particles or objects.

Step 2: Bar screens help in removing such large solid wastes from the system before further treatment.

Quick Tip

Bar screen = Initial stage of biomedical waste management (removes solids).

---

81. The dose of ionizing radiation for radappertization is

(1) 20 (MK) kGy

(2) 3 (MK) kGy

(3) 10 (MK) kGy

(4) 15 (MK) kGy

Correct Answer: (2) 3 (MK) kGy

Solution:

Step 1: Radappertization is a food irradiation process used to achieve commercial sterility.

Step 2: It typically requires a dose around 3 Mega Gray (kGy) to destroy all viable microorganisms.

Quick Tip

Radappertization dose 3 kGy to sterilize food.

---

82. A process where food is first frozen at minus 18 °C on trays and then placed under high vacuum is called as

(1) Freeze drying

(2) Cryogenic freezing

(3) Quick freezing

(4) Dehydro freezing

Correct Answer: (1) Freeze drying

Solution:

Step 1: Freeze drying, or lyophilization, involves freezing the food and then removing moisture via sublimation under vacuum.

Step 2: It preserves food with minimal loss of quality and nutrients.

Quick Tip

Freeze drying = Freeze at 18 °C + vacuum = sublimation drying.

---

83. Streamline and Equipotential line in a flow field

(1) Are parallel to each other

(2) Are perpendicular to each other

(3) Are identical to each other

(4) Intersects each other

Correct Answer: (2) Are perpendicular to each other

Solution:

Step 1: In a flow field, streamlines represent the path of fluid particles.

Step 2: Equipotential lines represent points of equal potential.

Step 3: These lines are always perpendicular in ideal flow.

Quick Tip

Streamlines Equipotential lines in ideal flow conditions.

---

84. A flow is called supersonic if the

(1) Velocity of the flow is very high

(2) Discharge is difficult to measure

(3) Mach number is less than 1

(4) Mach number is between 1 and 5

Correct Answer: (4) Mach number is between 1 and 5

Solution:

Step 1: Mach number = velocity of flow / speed of sound in medium.

Step 2: If Mach number ¿ 1, the flow is supersonic.

Step 3: Supersonic range is generally between 1 and 5.

Quick Tip

Supersonic flow: Mach number between 1 and 5.

---

85. Example of Non-Newtonian fluid is

(1) Emulsions

(2) Moist oils

(3) Gases

(4) Liquids

Correct Answer: (1) Emulsions

Solution:

Step 1: Non-Newtonian fluids do not obey Newton's law of viscosity.

Step 2: Emulsions like ketchup and paint exhibit shear-thinning or thickening behavior.

Step 3: Hence, emulsions are non-Newtonian.

Quick Tip

Non-Newtonian fluids: Viscosity changes with applied force; examples include emulsions and toothpaste.

---

86. The dynamic viscosity of a liquid is 1.2×10^{-4} Ns/m^2, whereas, the density is 600 kg/m^3.

The kinematic viscosity in m^2/s is

(1) 72×10^{-3}

(2) 20×10^{-8}

(3) 7.2×10^{3}

(4) 70×10^{6}

Correct Answer: (2) 20×10^{-8}

Solution:

Step 1: Use formula for kinematic viscosity: $\nu = \frac{\mu}{\rho}$

Step 2: $\nu = \frac{1.2 \times 10^{-4}}{600} = 2.0 \times 10^{-7}\,\text{m}^2/\text{s} = 20 \times 10^{-8}\,\text{m}^2/\text{s}$

Quick Tip

Kinematic viscosity = Dynamic viscosity ÷ Density

---

87. The rate of energy transferred by convection to that by conduction in a fluid is called

(1) Stanton number

(2) Nusselt number

(3) Biot number

(4) Peclet number

Correct Answer: (2) Nusselt number

Solution:

Step 1: Nusselt number (Nu) is the ratio of convective to conductive heat transfer across a boundary.

Step 2: It is used to characterize convective heat transfer.

Quick Tip

Nusselt number: $Nu = \frac{hL}{k}$, higher values indicate dominance of convection.

---

88. Fourier's law of heat conduction gives the heat flow for

(1) Irregular surfaces

(2) Non-uniform temperature surfaces

(3) One dimensional case only

(4) Two dimensional cases only

Correct Answer: (3) One dimensional case only

Solution:

Step 1: Fourier's law in its basic form applies to 1D steady-state heat conduction.

Step 2: For higher dimensions, the general form with gradient and vector calculus is used.

Quick Tip

In 1D: $q = -k\frac{dT}{dx}$; valid for steady-state with constant area.

---

89. The unit of overall coefficient of heat transfer is

(1) W/m^{2}K

(2) W/m^2

(3) W/m^3 K

(4) W/m K

Correct Answer: (1) W/m^{2}K

Solution:

Step 1: The heat transfer coefficient is given by $Q = UA\Delta T$

Step 2: Rearranging gives unit of U as $\frac{Q}{A\Delta T} \Rightarrow$ W/m^{2}K

Quick Tip

Always check the dimensions using the basic heat transfer formula $Q = UA\Delta T$.

---

90. Heat flux through several resistances in series is analogous to the current flowing through

(1) Resistances in parallel

(2) Resistances in series

(3) Capacitors in series

(4) Capacitors in parallel

Correct Answer: (2) Resistances in series

Solution:

Step 1: In thermal systems, resistances in series imply heat must flow through each one successively.

Step 2: This is similar to electrical resistances in series where current remains same.

Quick Tip

Use thermal-electric analogies: Heat flow is like current, thermal resistance is like electrical resistance.

---

91. Fouling factor

(1) Is a dimensionless quantity

(2) Does not provide a safety factor for design

(3) Accounts for additional resistance to heat transfer

(4) Reflects the quality factor of the food

Correct Answer: (3) Accounts for additional resistance to heat transfer

Solution:

Step 1: Fouling factor quantifies the expected reduction in heat transfer due to deposit accumulation.

Step 2: It is used in design to ensure sufficient area and efficiency in heat exchangers.

Quick Tip

Remember: Fouling factor = extra thermal resistance due to deposits on heat transfer surfaces.

---

92. Viscosities of gases ———— with increase in temperature

(1) Decreases

(2) Increases

(3) Decreases slowly

(4) Remains unchanged

Correct Answer: (2) Increases

Solution:

Step 1: As temperature increases, molecular movement increases.

Step 2: This leads to greater momentum transfer in gases, hence viscosity increases.

Quick Tip

For gases: Higher temperature means higher viscosity. For liquids, it's usually the opposite.

---

93. In a single effect evaporator, the economy is

(1) > 1

(2) $= 1$

(3) < 1

(4) Remains same

Correct Answer: (3) < 1

Solution:

Step 1: Economy of an evaporator is defined as the amount of vapor produced per unit mass of steam used.

Step 2: In a single effect evaporator, this is usually less than 1 due to energy losses.

Quick Tip

Multi-effect evaporators are used to increase economy beyond 1 by using vapor from one effect as heating medium for the next.

---

94. Mass transfer coefficient of liquid is

(1) Affected much less by temperature than that of gases

(2) Not affected by temperature

(3) Affected more by temperature than that of gases

(4) Affected by emulsion

Correct Answer: (3) Affected more by temperature than that of gases

Solution:

Step 1: The viscosity and diffusivity of liquids are significantly affected by temperature.

Step 2: This results in a more noticeable change in mass transfer coefficient for liquids with temperature variations compared to gases.

Quick Tip

Mass transfer in liquids is more sensitive to temperature due to stronger intermolecular interactions than in gases.

---

95. Molecular diffusion is caused by

(1) Transfer of molecules from low concentration to high concentration region

(2) Activation energy of the molecules

(3) Thermal energy of the molecules

(4) Potential energy of the molecules

Correct Answer: (3) Thermal energy of the molecules

Solution:

Step 1: Molecular diffusion is a result of random motion of particles driven by thermal energy.

Step 2: This movement causes the molecules to spread from regions of higher concentration to lower concentration.

Quick Tip

Thermal energy increases molecular motion, which enhances diffusion.

---

96. _____ exploits the differences in aerodynamic properties of the food and the contaminants

(1) Screening

(2) Abrasion

(3) Aspiration

(4) Dissolution

Correct Answer: (3) Aspiration

Solution:

Step 1: Aspiration is a cleaning method used to separate lighter contaminants from food particles based on aerodynamic properties.

Step 2: Air flow carries away light particles (like husks or dust) while heavier food items fall due to gravity.

Quick Tip

Aspiration is commonly used in grain cleaning processes to remove chaff and dust.

---

97. Which of the following force is used for the coarse crushing of materials?

(1) Impact force

(2) Compressive force

(3) Attrition force

(4) Shear force

Correct Answer: (2) Compressive force

Solution:

Step 1: Coarse crushing is typically carried out in jaw crushers or gyratory crushers.

Step 2: These devices primarily apply compressive force to reduce large chunks of material into smaller fragments.

Quick Tip

Coarse crushing uses compressive force; fine grinding often involves attrition or impact.

---

98. _____ is the average size of the feed particles divided by the average size of the product particles.

(1) Milling ratio

(2) Breaking ratio

(3) Size ratio

(4) Reduction ratio

Correct Answer: (4) Reduction ratio

Solution:

Step 1: The reduction ratio is a measure of the size reduction efficiency of a crusher or mill.

Step 2: It is calculated as the ratio of the average feed size to the average product size.

Quick Tip

Higher reduction ratio means more efficient size reduction.

---

99. The process of separating the components of a liquid mixture through selective evaporation and condensation is called

(1) Distillation

(2) Crystallization

(3) Sublimation

(4) Fractionation

Correct Answer: (1) Distillation

Solution:

Step 1: Distillation is a technique used to separate components in a liquid mixture.

Step 2: It works by heating the mixture to evaporate the more volatile component and then condensing the vapor to collect the purified substance.

Quick Tip

Distillation involves evaporation followed by condensation for separation based on boiling points.

---

100. The most commonly used form of mixer for handling low or moderate viscosity liquid is the _____ agitator

(1) Paddle

(2) Propeller

(3) Impeller

(4) Turbine

Correct Answer: (3) Impeller

Solution:

Step 1: Impeller agitators are effective for mixing low to moderately viscous liquids.

Step 2: They provide efficient circulation and shear, suitable for most general liquid mixing applications.

Quick Tip

Impeller agitators are widely used in industries for liquid mixing tasks due to their versatility.

---

101. Which of the following separation techniques does not depend upon the charges and the size of the separating material?

(1) Affinity chromatography

(2) Gel Filtration chromatography

(3) Ion exchange chromatography

(4) Gas chromatography

Correct Answer: (1) Affinity chromatography

Solution:

Step 1: Affinity chromatography relies on specific interactions between a molecule and a ligand attached to a stationary phase.

Step 2: It is highly selective and does not depend on charge or molecular size, unlike ion exchange or gel filtration.

Quick Tip

Affinity chromatography is based on biological specificity, not physical properties like size or charge.

---

102. Adulteration of edible oil by mineral oil can be identified by

(1) Halman's test

(2) Boudin's test

(3) Carl's test

(4) Holde's test

Correct Answer: (4) Holde's test

Solution:

Step 1: Holde's test is a qualitative method used to detect mineral oils in edible oils.

Step 2: It relies on the solubility difference in petroleum ether, revealing mineral oil presence.

Quick Tip

Holde's test is a key method to ensure purity of edible oils and detect harmful adulterants.

---

103. Black pepper is adulterated by

(1) Cotton seeds

(2) Papaya seeds

(3) Stones

(4) Charcoal

Correct Answer: (2) Papaya seeds

Solution:

Step 1: Papaya seeds resemble black pepper in size and appearance.

Step 2: They are often used as an adulterant due to their similar look but lack of pungency.

Quick Tip

To detect papaya seed adulteration, immerse pepper in water; papaya seeds float due to lower density.

---

104. Phosphatase test is used as an indicator for

(1) Caramelization

(2) Tyndallization

(3) Centrifugation

(4) Pasteurization

Correct Answer: (4) Pasteurization

Solution:

Step 1: The phosphatase enzyme is inactivated by proper pasteurization.

Step 2: Its presence indicates inadequate heat treatment.

Quick Tip

A negative phosphatase test confirms successful pasteurization of milk.

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105. The chart used to monitor attributes is

(1) Range chart

(2) Mean chart

(3) p-chart

(4) Z value

Correct Answer: (3) p-chart

Solution:

Step 1: Attribute charts are used for monitoring qualitative data (e.g., pass/fail, yes/no).

Step 2: The p-chart is used to monitor the proportion of defective items in a sample.

Quick Tip

Use p-charts when dealing with proportions or percentages of defective units.

---

106. The mean of sampling distribution should be

(1) Less than mean of process distribution

(2) More than mean of process distribution

(3) Equal to mean of process distribution

(4) Two folds to mean of process distribution

Correct Answer: (3) Equal to mean of process distribution

Solution:

Step 1: According to the Central Limit Theorem, the sampling distribution of the sample mean is centered at the population mean.

Step 2: Therefore, the mean of the sampling distribution equals the process (population) mean.

Quick Tip

The mean of the sampling distribution is an unbiased estimator of the population mean.

---

107. CCP in HACCP stands for

(1) Critical Control Point

(2) Crucial Control Point

(3) Common Control Point

(4) Common critical point

Correct Answer: (1) Critical Control Point

Solution:

Step 1: HACCP stands for Hazard Analysis and Critical Control Points.

Step 2: A Critical Control Point (CCP) is a step at which control can be applied to prevent or eliminate a food safety hazard.

Quick Tip

Remember: CCP is the step where control is essential to ensure food safety.

---

108. Which of the following task come under "Maintaining inventory of food processing systems and their environments"?

(1) Product specifications

(2) Physical systems hazards control

(3) Purchasing requirements

(4) Food Standardization

Correct Answer: (2) Physical systems hazards control

Solution:

Step 1: Inventory management in food processing includes monitoring physical conditions and hazard controls.

Step 2: Physical systems hazards control ensures that the processing environment remains safe and operational.

Quick Tip

Physical systems hazards control involves ensuring machinery, tools, and facilities are not sources of contamination.

---

109. Lacquering of cans helps in:

(1) Preventing cans from discoloration

(2) Providing cheaper way of coloring the can

(3) Providing mechanical strength

(4) Preventing can from shock during transportation

Correct Answer: (1) Preventing cans from discoloration

Solution:

Step 1: Lacquering is the coating of cans with a protective layer.

Step 2: This coating prevents chemical reactions between the can material and the food content, thereby avoiding discoloration.

Quick Tip

Lacquering prevents internal corrosion and staining of cans caused by acidic foods.

110. What is the first step of QA?

(1) Development of standards

(2) Identification of customer need

(3) Servicing

(4) Material control

Correct Answer: (2) Identification of customer need

Solution:

Step 1: Quality Assurance (QA) begins by understanding the customer's expectations and requirements.

Step 2: Only after identifying these needs can quality planning and standard development follow.

Quick Tip

In QA, identifying customer needs is foundational for setting benchmarks and ensuring satisfaction.

---

111. Agricultural and Processed Food Products Export Development Authority was established by the Government of India in

(1) December 1985

(2) December 1980

(3) December 1986

(4) January 1980

Correct Answer: (1) December 1985

Solution:

Step 1: APEDA was established by the Government of India through an act passed in 1985.

Step 2: It aims to promote the export of agricultural and processed food products.

Quick Tip

APEDA = Agricultural and Processed Food Products Export Development Authority; founded in December 1985.

---

112. The full form of IUU fishing is

(1) Illegal, Unreal and Unregulated

(2) Imported, Unreported and Unregulated

(3) Illegal, Unreported and Unregulated

(4) Illegal, Unreported and Unregistered

Correct Answer: (3) Illegal, Unreported and Unregulated

Solution:

Step 1: IUU fishing is a global problem affecting ocean sustainability.

Step 2: The acronym stands for Illegal, Unreported and Unregulated fishing, and it includes activities that violate conservation or management measures.

Quick Tip

IUU fishing = Illegal, Unreported, Unregulated — key focus area in marine conservation.

---

113. ”Standards on Weight and Measurement Act 1976” comes under

(1) Ministry of Health & Family Welfare

(2) Ministry of Food Processing Industries

(3) Department of Agriculture & Cooperation

(4) Department of Legal Metrology

Correct Answer: (4) Department of Legal Metrology

Solution:

Step 1: The “Standards of Weights and Measures Act, 1976” is enforced under the Legal Metrology framework.

Step 2: It deals with accurate weights and measures in trade and commerce, overseen by the Department of Legal Metrology.

Quick Tip

Weight and Measurement Acts are under Legal Metrology — ensures fairness in trade practices.

---

114. FSSAI stands for

(1) Food Safety and Standards Authority of India

(2) Food Safe Security Authorization of India

(3) Food Security and Supply Auditing of India

(4) Food Standards Security Authority of India

Correct Answer: (1) Food Safety and Standards Authority of India

Solution:

Step 1: FSSAI is the regulatory body for food safety in India.

Step 2: The correct expansion is "Food Safety and Standards Authority of India."

Quick Tip

FSSAI = Food Safety and Standards Authority of India — responsible for food safety regulations.

---

115. Food Safety and Standards Authority of India (FSSAI) was formed in the year

(1) 2009

(2) 2005

(3) 2011

(4) 2000

Correct Answer: (3) 2011

Solution:

Step 1: FSSAI was established under the Food Safety and Standards Act, 2006.

Step 2: It became fully operational in the year 2011.

Quick Tip

FSSAI started functioning fully in 2011, despite the act being passed in 2006.

---

116. What is the most important activity in the HACCP System?

(1) Calibrating Thermometers

(2) Pre-op

(3) Working with inspectors

(4) Monitoring

Correct Answer: (4) Monitoring

Solution:

Step 1: HACCP focuses on identifying critical control points in food processing.

Step 2: Monitoring ensures that these points stay within safety limits and is the core of HACCP.

Quick Tip

In HACCP, monitoring is key to ensuring hazards are under control at critical points.

---

117. Food Safety and Standards Act, 2006 – passed by Indian Parliament and notified on

(1) 24th July, 2006

(2) 24th June, 2006

(3) 24th August, 2006

(4) 24th November, 2006

Correct Answer: (3) 24th August, 2006

Solution:

Step 1: The Food Safety and Standards Act, 2006 was passed by the Indian Parliament.

Step 2: The official date of notification of the act was 24th August, 2006.

Quick Tip

Always remember the FSS Act was notified on 24th August, 2006, even though passed earlier.

---

118. The known food allergens are considered a hazard when

(1) undeclared on a food product label.

(2) sold in interstate commerce.

(3) product is made under the cottage food law.

(4) consumed by a highly susceptible population.

Correct Answer: (1) undeclared on a food product label.

Solution:

Step 1: Food allergens must be declared clearly to ensure consumer safety.

Step 2: Failure to declare known allergens can cause serious health risks, making it a hazard.

Quick Tip

Label transparency is critical—undeclared allergens can lead to food safety violations.

---

119. It is a legal requirement for all food businesses to

(1) Register the premises with the local authority before trading.

(2) Obtain a license to operate from the Food Standards Agency.

(3) Apply for a license from the local magistrates' court.

(4) Book annual inspections with the environmental health authority.

Correct Answer: (1) Register the premises with the local authority before trading.

Solution:

Step 1: According to food law, all food businesses must register with local authorities.

Step 2: This step ensures traceability and accountability before beginning operations.

Quick Tip

Food business registration with the local authority is mandatory and usually free of charge.

---

120. What does ISO do

(1) Provides organizations with information about quality management systems

(2) Helps organizations become certified under the international standard

(3) Government responsibilities and tasks in various countries

(4) Monitors the food Safety of consumer foods.

Correct Answer: (1) Provides organizations with information about quality management systems

Solution:

Step 1: ISO (International Organization for Standardization) sets out global standards.

Step 2: It provides frameworks and guidelines, especially for quality management.

Quick Tip

Remember: ISO defines standards—it doesn't certify; certification is done by accredited bodies.
