

**Sample Question Paper**  
**CLASS: XII**  
**Session: 2021-22**  
**Mathematics (Code-041)**  
**Term - 1**

Time Allowed: 90 minutes

Maximum Marks: 40

**General Instructions:**

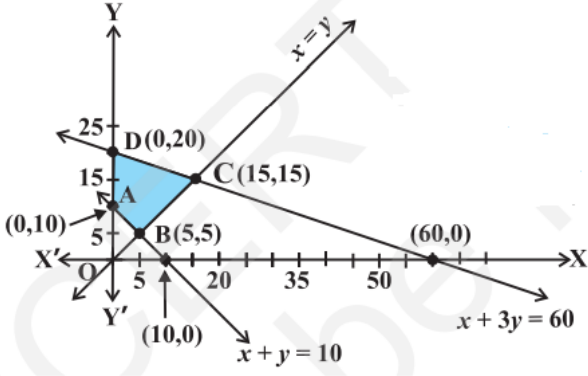
1. This question paper contains **three sections – A, B and C**. Each part is compulsory.
2. **Section - A** has 20 MCQs, attempt **any 16 out of 20**.
3. **Section - B** has 20 MCQs, attempt **any 16 out of 20**.
4. **Section - C** has 10 MCQs, attempt **any 8 out of 10**.
5. There is no negative marking.
6. All questions carry equal marks.

**SECTION – A**

In this section, attempt any 16 questions out of Questions 1 – 20.  
Each Question is of 1 mark weightage.

1.	$\sin \left[ \frac{\pi}{3} - \sin^{-1} \left( -\frac{1}{2} \right) \right]$ is equal to: <table border="1" style="width: 100%; margin-top: 10px;"> <tbody> <tr> <td style="width: 50%; text-align: center;">a) <math>\frac{1}{2}</math></td> <td style="width: 50%; text-align: center;">b) <math>\frac{1}{3}</math></td> </tr> <tr> <td style="width: 50%; text-align: center;">c) -1</td> <td style="width: 50%; text-align: center;">d) 1</td> </tr> </tbody> </table>	a) $\frac{1}{2}$	b) $\frac{1}{3}$	c) -1	d) 1	1
a) $\frac{1}{2}$	b) $\frac{1}{3}$					
c) -1	d) 1					
2.	The value of $k$ ( $k < 0$ ) for which the function $f$ defined as $f(x) = \begin{cases} \frac{1 - \cos kx}{x \sin x}, & x \neq 0 \\ \frac{1}{2}, & x = 0 \end{cases}$ is continuous at $x = 0$ is: <table border="1" style="width: 100%; margin-top: 10px;"> <tbody> <tr> <td style="width: 50%; text-align: center;">a) <math>\pm 1</math></td> <td style="width: 50%; text-align: center;">b) <math>-1</math></td> </tr> <tr> <td style="width: 50%; text-align: center;">c) <math>\pm \frac{1}{2}</math></td> <td style="width: 50%; text-align: center;">d) <math>\frac{1}{2}</math></td> </tr> </tbody> </table>	a) $\pm 1$	b) $-1$	c) $\pm \frac{1}{2}$	d) $\frac{1}{2}$	1
a) $\pm 1$	b) $-1$					
c) $\pm \frac{1}{2}$	d) $\frac{1}{2}$					
3.	If $A = [a_{ij}]$ is a square matrix of order 2 such that $a_{ij} = \begin{cases} 1, & \text{when } i \neq j \\ 0, & \text{when } i = j \end{cases}$ , then $A^2$ is: <table border="1" style="width: 100%; margin-top: 10px;"> <tbody> <tr> <td style="width: 50%; text-align: center;">a) <math>\begin{bmatrix} 1 &amp; 0 \\ 1 &amp; 0 \end{bmatrix}</math></td> <td style="width: 50%; text-align: center;">b) <math>\begin{bmatrix} 1 &amp; 1 \\ 0 &amp; 0 \end{bmatrix}</math></td> </tr> <tr> <td style="width: 50%; text-align: center;">c) <math>\begin{bmatrix} 1 &amp; 1 \\ 1 &amp; 0 \end{bmatrix}</math></td> <td style="width: 50%; text-align: center;">d) <math>\begin{bmatrix} 1 &amp; 0 \\ 0 &amp; 1 \end{bmatrix}</math></td> </tr> </tbody> </table>	a) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$	b) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$	c) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$	d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	1
a) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$	b) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$					
c) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$	d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$					
4.	Value of $k$ , for which $A = \begin{bmatrix} k & 8 \\ 4 & 2k \end{bmatrix}$ is a singular matrix is: <table border="1" style="width: 100%; margin-top: 10px;"> <tbody> <tr> <td style="width: 50%; text-align: center;">a) 4</td> <td style="width: 50%; text-align: center;">b) -4</td> </tr> <tr> <td style="width: 50%; text-align: center;">c) <math>\pm 4</math></td> <td style="width: 50%; text-align: center;">d) 0</td> </tr> </tbody> </table>	a) 4	b) -4	c) $\pm 4$	d) 0	1
a) 4	b) -4					
c) $\pm 4$	d) 0					

5.	<p>Find the intervals in which the function <math>f</math> given by <math>f(x) = x^2 - 4x + 6</math> is strictly increasing:</p> <table border="1"> <tbody> <tr> <td>a) <math>(-\infty, 2) \cup (2, \infty)</math></td> <td>b) <math>(2, \infty)</math></td> </tr> <tr> <td>c) <math>(-\infty, 2)</math></td> <td>d) <math>(-\infty, 2] \cup (2, \infty)</math></td> </tr> </tbody> </table>	a) $(-\infty, 2) \cup (2, \infty)$	b) $(2, \infty)$	c) $(-\infty, 2)$	d) $(-\infty, 2] \cup (2, \infty)$	1
a) $(-\infty, 2) \cup (2, \infty)$	b) $(2, \infty)$					
c) $(-\infty, 2)$	d) $(-\infty, 2] \cup (2, \infty)$					
6.	<p>Given that <math>A</math> is a square matrix of order 3 and <math> A  = -4</math>, then <math> \text{adj } A </math> is equal to:</p> <table border="1"> <tbody> <tr> <td>a) -4</td> <td>b) 4</td> </tr> <tr> <td>c) -16</td> <td>d) 16</td> </tr> </tbody> </table>	a) -4	b) 4	c) -16	d) 16	1
a) -4	b) 4					
c) -16	d) 16					
7.	<p>A relation <math>R</math> in set <math>A = \{1, 2, 3\}</math> is defined as <math>R = \{(1, 1), (1, 2), (2, 2), (3, 3)\}</math>. Which of the following ordered pair in <math>R</math> shall be removed to make it an equivalence relation in <math>A</math>?</p> <table border="1"> <tbody> <tr> <td>a) <math>(1, 1)</math></td> <td>b) <math>(1, 2)</math></td> </tr> <tr> <td>c) <math>(2, 2)</math></td> <td>d) <math>(3, 3)</math></td> </tr> </tbody> </table>	a) $(1, 1)$	b) $(1, 2)$	c) $(2, 2)$	d) $(3, 3)$	1
a) $(1, 1)$	b) $(1, 2)$					
c) $(2, 2)$	d) $(3, 3)$					
8.	<p>If <math>\begin{bmatrix} 2a + b &amp; a - 2b \\ 5c - d &amp; 4c + 3d \end{bmatrix} = \begin{bmatrix} 4 &amp; -3 \\ 11 &amp; 24 \end{bmatrix}</math>, then value of <math>a + b - c + 2d</math> is:</p> <table border="1"> <tbody> <tr> <td>a) 8</td> <td>b) 10</td> </tr> <tr> <td>c) 4</td> <td>d) -8</td> </tr> </tbody> </table>	a) 8	b) 10	c) 4	d) -8	1
a) 8	b) 10					
c) 4	d) -8					
9.	<p>The point at which the normal to the curve <math>y = x + \frac{1}{x}</math>, <math>x &gt; 0</math> is perpendicular to the line <math>3x - 4y - 7 = 0</math> is:</p> <table border="1"> <tbody> <tr> <td>a) <math>(2, 5/2)</math></td> <td>b) <math>(\pm 2, 5/2)</math></td> </tr> <tr> <td>c) <math>(-1/2, 5/2)</math></td> <td>d) <math>(1/2, 5/2)</math></td> </tr> </tbody> </table>	a) $(2, 5/2)$	b) $(\pm 2, 5/2)$	c) $(-1/2, 5/2)$	d) $(1/2, 5/2)$	1
a) $(2, 5/2)$	b) $(\pm 2, 5/2)$					
c) $(-1/2, 5/2)$	d) $(1/2, 5/2)$					
10.	<p><math>\sin(\tan^{-1}x)</math>, where <math> x  &lt; 1</math>, is equal to:</p> <table border="1"> <tbody> <tr> <td>a) <math>\frac{x}{\sqrt{1-x^2}}</math></td> <td>b) <math>\frac{1}{\sqrt{1-x^2}}</math></td> </tr> <tr> <td>c) <math>\frac{1}{\sqrt{1+x^2}}</math></td> <td>d) <math>\frac{x}{\sqrt{1+x^2}}</math></td> </tr> </tbody> </table>	a) $\frac{x}{\sqrt{1-x^2}}$	b) $\frac{1}{\sqrt{1-x^2}}$	c) $\frac{1}{\sqrt{1+x^2}}$	d) $\frac{x}{\sqrt{1+x^2}}$	1
a) $\frac{x}{\sqrt{1-x^2}}$	b) $\frac{1}{\sqrt{1-x^2}}$					
c) $\frac{1}{\sqrt{1+x^2}}$	d) $\frac{x}{\sqrt{1+x^2}}$					
11.	<p>Let the relation <math>R</math> in the set <math>A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}</math>, given by <math>R = \{(a, b) :  a - b  \text{ is a multiple of } 4\}</math>. Then <math>[1]</math>, the equivalence class containing 1, is:</p> <table border="1"> <tbody> <tr> <td>a) <math>\{1, 5, 9\}</math></td> <td>b) <math>\{0, 1, 2, 5\}</math></td> </tr> <tr> <td>c) <math>\phi</math></td> <td>d) <math>A</math></td> </tr> </tbody> </table>	a) $\{1, 5, 9\}$	b) $\{0, 1, 2, 5\}$	c) $\phi$	d) $A$	1
a) $\{1, 5, 9\}$	b) $\{0, 1, 2, 5\}$					
c) $\phi$	d) $A$					
12.	<p>If <math>e^x + e^y = e^{x+y}</math>, then <math>\frac{dy}{dx}</math> is:</p> <table border="1"> <tbody> <tr> <td>a) <math>e^{y-x}</math></td> <td>b) <math>e^{x+y}</math></td> </tr> <tr> <td>c) <math>-e^{y-x}</math></td> <td>d) <math>2e^{x-y}</math></td> </tr> </tbody> </table>	a) $e^{y-x}$	b) $e^{x+y}$	c) $-e^{y-x}$	d) $2e^{x-y}$	1
a) $e^{y-x}$	b) $e^{x+y}$					
c) $-e^{y-x}$	d) $2e^{x-y}$					

13.	<p>Given that matrices A and B are of order <math>3 \times n</math> and <math>m \times 5</math> respectively, then the order of matrix <math>C = 5A + 3B</math> is:</p> <table border="1"> <tr> <td>a) <math>3 \times 5</math> and <math>m = n</math></td> <td>b) <math>3 \times 5</math></td> </tr> <tr> <td>c) <math>3 \times 3</math></td> <td>d) <math>5 \times 5</math></td> </tr> </table>	a) $3 \times 5$ and $m = n$	b) $3 \times 5$	c) $3 \times 3$	d) $5 \times 5$	1
a) $3 \times 5$ and $m = n$	b) $3 \times 5$					
c) $3 \times 3$	d) $5 \times 5$					
14.	<p>If <math>y = 5 \cos x - 3 \sin x</math>, then <math>\frac{d^2y}{dx^2}</math> is equal to:</p> <table border="1"> <tr> <td>a) <math>-y</math></td> <td>b) <math>y</math></td> </tr> <tr> <td>c) <math>25y</math></td> <td>d) <math>9y</math></td> </tr> </table>	a) $-y$	b) $y$	c) $25y$	d) $9y$	1
a) $-y$	b) $y$					
c) $25y$	d) $9y$					
15.	<p>For matrix <math>A = \begin{bmatrix} 2 &amp; 5 \\ -11 &amp; 7 \end{bmatrix}</math>, <math>(adjA)'</math> is equal to:</p> <table border="1"> <tr> <td>a) <math>\begin{bmatrix} -2 &amp; -5 \\ 11 &amp; -7 \end{bmatrix}</math></td> <td>b) <math>\begin{bmatrix} 7 &amp; 5 \\ 11 &amp; 2 \end{bmatrix}</math></td> </tr> <tr> <td>c) <math>\begin{bmatrix} 7 &amp; 11 \\ -5 &amp; 2 \end{bmatrix}</math></td> <td>d) <math>\begin{bmatrix} 7 &amp; -5 \\ 11 &amp; 2 \end{bmatrix}</math></td> </tr> </table>	a) $\begin{bmatrix} -2 & -5 \\ 11 & -7 \end{bmatrix}$	b) $\begin{bmatrix} 7 & 5 \\ 11 & 2 \end{bmatrix}$	c) $\begin{bmatrix} 7 & 11 \\ -5 & 2 \end{bmatrix}$	d) $\begin{bmatrix} 7 & -5 \\ 11 & 2 \end{bmatrix}$	1
a) $\begin{bmatrix} -2 & -5 \\ 11 & -7 \end{bmatrix}$	b) $\begin{bmatrix} 7 & 5 \\ 11 & 2 \end{bmatrix}$					
c) $\begin{bmatrix} 7 & 11 \\ -5 & 2 \end{bmatrix}$	d) $\begin{bmatrix} 7 & -5 \\ 11 & 2 \end{bmatrix}$					
16.	<p>The points on the curve <math>\frac{x^2}{9} + \frac{y^2}{16} = 1</math> at which the tangents are parallel to y-axis are:</p> <table border="1"> <tr> <td>a) <math>(0, \pm 4)</math></td> <td>b) <math>(\pm 4, 0)</math></td> </tr> <tr> <td>c) <math>(\pm 3, 0)</math></td> <td>d) <math>(0, \pm 3)</math></td> </tr> </table>	a) $(0, \pm 4)$	b) $(\pm 4, 0)$	c) $(\pm 3, 0)$	d) $(0, \pm 3)$	1
a) $(0, \pm 4)$	b) $(\pm 4, 0)$					
c) $(\pm 3, 0)$	d) $(0, \pm 3)$					
17.	<p>Given that <math>A = [a_{ij}]</math> is a square matrix of order <math>3 \times 3</math> and <math> A  = -7</math>, then the value of <math>\sum_{i=1}^3 a_{i2}A_{i2}</math>, where <math>A_{ij}</math> denotes the cofactor of element <math>a_{ij}</math> is:</p> <table border="1"> <tr> <td>a) 7</td> <td>b) -7</td> </tr> <tr> <td>c) 0</td> <td>d) 49</td> </tr> </table>	a) 7	b) -7	c) 0	d) 49	1
a) 7	b) -7					
c) 0	d) 49					
18.	<p>If <math>y = \log(\cos e^x)</math>, then <math>\frac{dy}{dx}</math> is:</p> <table border="1"> <tr> <td>a) <math>\cos e^{x-1}</math></td> <td>b) <math>e^{-x} \cos e^x</math></td> </tr> <tr> <td>c) <math>e^x \sin e^x</math></td> <td>d) <math>-e^x \tan e^x</math></td> </tr> </table>	a) $\cos e^{x-1}$	b) $e^{-x} \cos e^x$	c) $e^x \sin e^x$	d) $-e^x \tan e^x$	1
a) $\cos e^{x-1}$	b) $e^{-x} \cos e^x$					
c) $e^x \sin e^x$	d) $-e^x \tan e^x$					
19.	<p>Based on the given shaded region as the feasible region in the graph, at which point(s) is the objective function <math>Z = 3x + 9y</math> maximum?</p>  <table border="1"> <tr> <td>a) Point B</td> <td>b) Point C</td> </tr> <tr> <td>c) Point D</td> <td>d) every point on the line segment CD</td> </tr> </table>	a) Point B	b) Point C	c) Point D	d) every point on the line segment CD	1
a) Point B	b) Point C					
c) Point D	d) every point on the line segment CD					

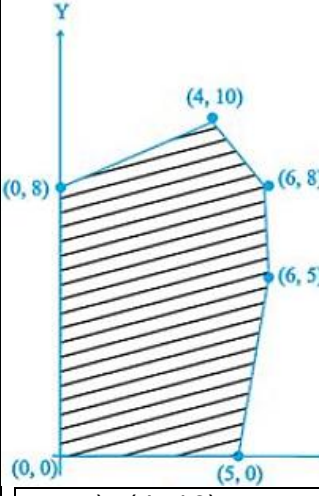
20.	The least value of the function $f(x) = 2\cos x + x$ in the closed interval $[0, \frac{\pi}{2}]$ is:		1
	a) 2	b) $\frac{\pi}{6} + \sqrt{3}$	
	c) $\frac{\pi}{2}$	d) The least value does not exist.	

**SECTION – B**

**In this section, attempt any 16 questions out of the Questions 21 - 40. Each Question is of 1 mark weightage.**

21.	The function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = x^3$ is:		1
	a) One-on but not onto	b) Not one-one but onto	
	c) Neither one-one nor onto	d) One-one and onto	

22.	If $x = a \sec \theta$ , $y = b \tan \theta$ , then $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{6}$ is:		1
	a) $\frac{-3\sqrt{3}b}{a^2}$	b) $\frac{-2\sqrt{3}b}{a}$	
	c) $\frac{-3\sqrt{3}b}{a}$	d) $\frac{-b}{3\sqrt{3}a^2}$	

23.	 <p>In the given graph, the feasible region for a LPP is shaded. The objective function <math>Z = 2x - 3y</math>, will be minimum at:</p>	1		
			a) (4, 10)	b) (6, 8)
			c) (0, 8)	d) (6, 5)

24.	The derivative of $\sin^{-1}(2x\sqrt{1-x^2})$ w.r.t $\sin^{-1}x$ , $\frac{1}{\sqrt{2}} < x < 1$ , is:		1
	a) 2	b) $\frac{\pi}{2} - 2$	
	c) $\frac{\pi}{2}$	d) -2	

25.	If $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ , then:		1
	a) $A^{-1} = B$	b) $A^{-1} = 6B$	
	c) $B^{-1} = B$	d) $B^{-1} = \frac{1}{6}A$	

26.	<p>The real function <math>f(x) = 2x^3 - 3x^2 - 36x + 7</math> is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td colspan="2">a) Strictly increasing in <math>(-\infty, -2)</math> and strictly decreasing in <math>(-2, \infty)</math></td> </tr> <tr> <td colspan="2">b) Strictly decreasing in <math>(-2, 3)</math></td> </tr> <tr> <td colspan="2">c) Strictly decreasing in <math>(-\infty, 3)</math> and strictly increasing in <math>(3, \infty)</math></td> </tr> <tr> <td colspan="2">d) Strictly decreasing in <math>(-\infty, -2) \cup (3, \infty)</math></td> </tr> </tbody> </table>	a) Strictly increasing in $(-\infty, -2)$ and strictly decreasing in $(-2, \infty)$		b) Strictly decreasing in $(-2, 3)$		c) Strictly decreasing in $(-\infty, 3)$ and strictly increasing in $(3, \infty)$		d) Strictly decreasing in $(-\infty, -2) \cup (3, \infty)$		1
a) Strictly increasing in $(-\infty, -2)$ and strictly decreasing in $(-2, \infty)$										
b) Strictly decreasing in $(-2, 3)$										
c) Strictly decreasing in $(-\infty, 3)$ and strictly increasing in $(3, \infty)$										
d) Strictly decreasing in $(-\infty, -2) \cup (3, \infty)$										
27.	<p>Simplest form of <math>\tan^{-1} \left( \frac{\sqrt{1+\cos x} + \sqrt{1-\cos x}}{\sqrt{1+\cos x} - \sqrt{1-\cos x}} \right), \pi &lt; x &lt; \frac{3\pi}{2}</math> is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>a) <math>\frac{\pi}{4} - \frac{x}{2}</math></td> <td>b) <math>\frac{3\pi}{2} - \frac{x}{2}</math></td> </tr> <tr> <td>c) <math>-\frac{x}{2}</math></td> <td>d) <math>\pi - \frac{x}{2}</math></td> </tr> </tbody> </table>	a) $\frac{\pi}{4} - \frac{x}{2}$	b) $\frac{3\pi}{2} - \frac{x}{2}$	c) $-\frac{x}{2}$	d) $\pi - \frac{x}{2}$	1				
a) $\frac{\pi}{4} - \frac{x}{2}$	b) $\frac{3\pi}{2} - \frac{x}{2}$									
c) $-\frac{x}{2}$	d) $\pi - \frac{x}{2}$									
28.	<p>Given that A is a non-singular matrix of order 3 such that <math>A^2 = 2A</math>, then value of <math> 2A </math> is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>a) 4</td> <td>b) 8</td> </tr> <tr> <td>c) 64</td> <td>d) 16</td> </tr> </tbody> </table>	a) 4	b) 8	c) 64	d) 16	1				
a) 4	b) 8									
c) 64	d) 16									
29.	<p>The value of <math>b</math> for which the function <math>f(x) = x + \cos x + b</math> is strictly decreasing over <math>\mathbf{R}</math> is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>a) <math>b &lt; 1</math></td> <td>b) No value of <math>b</math> exists</td> </tr> <tr> <td>c) <math>b \leq 1</math></td> <td>d) <math>b \geq 1</math></td> </tr> </tbody> </table>	a) $b < 1$	b) No value of $b$ exists	c) $b \leq 1$	d) $b \geq 1$	1				
a) $b < 1$	b) No value of $b$ exists									
c) $b \leq 1$	d) $b \geq 1$									
30.	<p>Let R be the relation in the set N given by <math>R = \{(a, b) : a = b - 2, b &gt; 6\}</math>, then:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>a) <math>(2, 4) \in R</math></td> <td>b) <math>(3, 8) \in R</math></td> </tr> <tr> <td>c) <math>(6, 8) \in R</math></td> <td>d) <math>(8, 7) \in R</math></td> </tr> </tbody> </table>	a) $(2, 4) \in R$	b) $(3, 8) \in R$	c) $(6, 8) \in R$	d) $(8, 7) \in R$	1				
a) $(2, 4) \in R$	b) $(3, 8) \in R$									
c) $(6, 8) \in R$	d) $(8, 7) \in R$									
31.	<p>The point(s), at which the function <math>f</math> given by <math>f(x) = \begin{cases} \frac{x}{ x }, &amp; x &lt; 0 \\ -1, &amp; x \geq 0 \end{cases}</math> is continuous, is/are:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>a) <math>x \in \mathbf{R}</math></td> <td>b) <math>x = 0</math></td> </tr> <tr> <td>c) <math>x \in \mathbf{R} - \{0\}</math></td> <td>d) <math>x = -1</math> and <math>1</math></td> </tr> </tbody> </table>	a) $x \in \mathbf{R}$	b) $x = 0$	c) $x \in \mathbf{R} - \{0\}$	d) $x = -1$ and $1$	1				
a) $x \in \mathbf{R}$	b) $x = 0$									
c) $x \in \mathbf{R} - \{0\}$	d) $x = -1$ and $1$									
32.	<p>If <math>A = \begin{bmatrix} 0 &amp; 2 \\ 3 &amp; -4 \end{bmatrix}</math> and <math>kA = \begin{bmatrix} 0 &amp; 3a \\ 2b &amp; 24 \end{bmatrix}</math>, then the values of <math>k, a</math> and <math>b</math> respectively are:</p>	1								

	<table border="1"> <tr> <td>a) <math>-6, -12, -18</math></td> <td>b) <math>-6, -4, -9</math></td> </tr> <tr> <td>c) <math>-6, 4, 9</math></td> <td>d) <math>-6, 12, 18</math></td> </tr> </table>	a) $-6, -12, -18$	b) $-6, -4, -9$	c) $-6, 4, 9$	d) $-6, 12, 18$	
a) $-6, -12, -18$	b) $-6, -4, -9$					
c) $-6, 4, 9$	d) $-6, 12, 18$					
33.	<p>A linear programming problem is as follows:  <i>Minimize</i> <math>Z = 30x + 50y</math>  subject to the constraints,</p> $3x + 5y \geq 15$ $2x + 3y \leq 18$ $x \geq 0, y \geq 0$ <p>In the feasible region, the minimum value of Z occurs at</p> <table border="1"> <tr> <td>a) a unique point</td> <td>b) no point</td> </tr> <tr> <td>c) infinitely many points</td> <td>d) two points only</td> </tr> </table>	a) a unique point	b) no point	c) infinitely many points	d) two points only	1
a) a unique point	b) no point					
c) infinitely many points	d) two points only					
34.	<p>The area of a trapezium is defined by function <math>f</math> and given by <math>f(x) = (10 + x)\sqrt{100 - x^2}</math>, then the area when it is maximised is:</p> <table border="1"> <tr> <td>a) <math>75\text{cm}^2</math></td> <td>b) <math>7\sqrt{3}\text{cm}^2</math></td> </tr> <tr> <td>c) <math>75\sqrt{3}\text{cm}^2</math></td> <td>d) <math>5\text{cm}^2</math></td> </tr> </table>	a) $75\text{cm}^2$	b) $7\sqrt{3}\text{cm}^2$	c) $75\sqrt{3}\text{cm}^2$	d) $5\text{cm}^2$	1
a) $75\text{cm}^2$	b) $7\sqrt{3}\text{cm}^2$					
c) $75\sqrt{3}\text{cm}^2$	d) $5\text{cm}^2$					
35.	<p>If A is square matrix such that <math>A^2 = A</math>, then <math>(I + A)^3 - 7A</math> is equal to:</p> <table border="1"> <tr> <td>a) A</td> <td>b) <math>I + A</math></td> </tr> <tr> <td>c) <math>I - A</math></td> <td>d) I</td> </tr> </table>	a) A	b) $I + A$	c) $I - A$	d) I	1
a) A	b) $I + A$					
c) $I - A$	d) I					
36.	<p>If <math>\tan^{-1} x = y</math>, then:</p> <table border="1"> <tr> <td>a) <math>-1 &lt; y &lt; 1</math></td> <td>b) <math>\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}</math></td> </tr> <tr> <td>c) <math>\frac{-\pi}{2} &lt; y &lt; \frac{\pi}{2}</math></td> <td>d) <math>y \in \{\frac{-\pi}{2}, \frac{\pi}{2}\}</math></td> </tr> </table>	a) $-1 < y < 1$	b) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$	c) $\frac{-\pi}{2} < y < \frac{\pi}{2}$	d) $y \in \{\frac{-\pi}{2}, \frac{\pi}{2}\}$	1
a) $-1 < y < 1$	b) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$					
c) $\frac{-\pi}{2} < y < \frac{\pi}{2}$	d) $y \in \{\frac{-\pi}{2}, \frac{\pi}{2}\}$					
37.	<p>Let <math>A = \{1, 2, 3\}</math>, <math>B = \{4, 5, 6, 7\}</math> and let <math>f = \{(1, 4), (2, 5), (3, 6)\}</math> be a function from A to B. Based on the given information, <math>f</math> is best defined as:</p> <table border="1"> <tr> <td>a) Surjective function</td> <td>b) Injective function</td> </tr> <tr> <td>c) Bijective function</td> <td>d) function</td> </tr> </table>	a) Surjective function	b) Injective function	c) Bijective function	d) function	1
a) Surjective function	b) Injective function					
c) Bijective function	d) function					
38.	<p>For <math>A = \begin{bmatrix} 3 &amp; 1 \\ -1 &amp; 2 \end{bmatrix}</math>, then <math>14A^{-1}</math> is given by:</p> <table border="1"> <tr> <td>a) <math>14 \begin{bmatrix} 2 &amp; -1 \\ 1 &amp; 3 \end{bmatrix}</math></td> <td>b) <math>\begin{bmatrix} 4 &amp; -2 \\ 2 &amp; 6 \end{bmatrix}</math></td> </tr> <tr> <td>c) <math>2 \begin{bmatrix} 2 &amp; -1 \\ 1 &amp; -3 \end{bmatrix}</math></td> <td>d) <math>2 \begin{bmatrix} -3 &amp; -1 \\ 1 &amp; -2 \end{bmatrix}</math></td> </tr> </table>	a) $14 \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$	b) $\begin{bmatrix} 4 & -2 \\ 2 & 6 \end{bmatrix}$	c) $2 \begin{bmatrix} 2 & -1 \\ 1 & -3 \end{bmatrix}$	d) $2 \begin{bmatrix} -3 & -1 \\ 1 & -2 \end{bmatrix}$	1
a) $14 \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$	b) $\begin{bmatrix} 4 & -2 \\ 2 & 6 \end{bmatrix}$					
c) $2 \begin{bmatrix} 2 & -1 \\ 1 & -3 \end{bmatrix}$	d) $2 \begin{bmatrix} -3 & -1 \\ 1 & -2 \end{bmatrix}$					
39.	<p>The point(s) on the curve <math>y = x^3 - 11x + 5</math> at which the tangent is <math>y = x - 11</math> is/are:</p> <table border="1"> <tr> <td>a) <math>(-2, 19)</math></td> <td>b) <math>(2, -9)</math></td> </tr> <tr> <td>c) <math>(\pm 2, 19)</math></td> <td>d) <math>(-2, 19)</math> and <math>(2, -9)</math></td> </tr> </table>	a) $(-2, 19)$	b) $(2, -9)$	c) $(\pm 2, 19)$	d) $(-2, 19)$ and $(2, -9)$	1
a) $(-2, 19)$	b) $(2, -9)$					
c) $(\pm 2, 19)$	d) $(-2, 19)$ and $(2, -9)$					
40.	<p>Given that <math>A = \begin{bmatrix} \alpha &amp; \beta \\ \gamma &amp; -\alpha \end{bmatrix}</math> and <math>A^2 = 3I</math>, then:</p>	1				

$$a) 1 + \alpha^2 + \beta\gamma = 0$$

$$b) 1 - \alpha^2 - \beta\gamma = 0$$

$$c) 3 - \alpha^2 - \beta\gamma = 0$$

$$d) 3 + \alpha^2 + \beta\gamma = 0$$

### SECTION – C

In this section, attempt any 8 questions.

Each question is of 1-mark weightage.

Questions 46-50 are based on a Case-Study.

41. For an objective function  $Z = ax + by$ , where  $a, b > 0$ ; the corner points of the feasible region determined by a set of constraints (linear inequalities) are  $(0, 20)$ ,  $(10, 10)$ ,  $(30, 30)$  and  $(0, 40)$ . The condition on  $a$  and  $b$  such that the maximum  $Z$  occurs at both the points  $(30, 30)$  and  $(0, 40)$  is:

$$a) b - 3a = 0$$

$$b) a = 3b$$

$$c) a + 2b = 0$$

$$d) 2a - b = 0$$

42. For which value of  $m$  is the line  $y = mx + 1$  a tangent to the curve  $y^2 = 4x$ ?

$$a) \frac{1}{2}$$

$$b) 1$$

$$c) 2$$

$$d) 3$$

43. The maximum value of  $[x(x - 1) + 1]^{\frac{1}{3}}$ ,  $0 \leq x \leq 1$  is:

$$a) 0$$

$$b) \frac{1}{2}$$

$$c) 1$$

$$d) \sqrt[3]{\frac{1}{3}}$$

44. In a linear programming problem, the constraints on the decision variables  $x$  and  $y$  are  $x - 3y \geq 0$ ,  $y \geq 0$ ,  $0 \leq x \leq 3$ . The feasible region

a) is not in the first quadrant

b) is bounded in the first quadrant

c) is unbounded in the first quadrant

d) does not exist

45. Let  $A = \begin{bmatrix} 1 & \sin\alpha & 1 \\ -\sin\alpha & 1 & \sin\alpha \\ -1 & -\sin\alpha & 1 \end{bmatrix}$ , where  $0 \leq \alpha \leq 2\pi$ , then:

$$a) |A|=0$$

$$b) |A| \in (2, \infty)$$

$$c) |A| \in (2, 4)$$

$$d) |A| \in [2, 4]$$

### CASE STUDY



The fuel cost per hour for running a train is proportional to the square of the speed it generates in km per hour. If the fuel costs ₹ 48 per hour at speed 16 km per hour and the fixed charges to run the train amount to ₹ 1200 per hour.

Assume the speed of the train as  $v$  km/h.

Based on the given information, answer the following questions.						
46.	Given that the fuel cost per hour is $k$ times the square of the speed the train generates in km/h, the value of $k$ is:	1				
	<table border="1"> <tr> <td>a) <math>\frac{16}{3}</math></td> <td>b) <math>\frac{1}{3}</math></td> </tr> <tr> <td>c) 3</td> <td>d) <math>\frac{3}{16}</math></td> </tr> </table>	a) $\frac{16}{3}$	b) $\frac{1}{3}$	c) 3	d) $\frac{3}{16}$	
a) $\frac{16}{3}$	b) $\frac{1}{3}$					
c) 3	d) $\frac{3}{16}$					
47.	If the train has travelled a distance of 500km, then the total cost of running the train is given by function:	1				
	<table border="1"> <tr> <td>a) <math>\frac{15}{16}v + \frac{600000}{v}</math></td> <td>b) <math>\frac{375}{4}v + \frac{600000}{v}</math></td> </tr> <tr> <td>c) <math>\frac{5}{16}v^2 + \frac{150000}{v}</math></td> <td>d) <math>\frac{3}{16}v + \frac{6000}{v}</math></td> </tr> </table>	a) $\frac{15}{16}v + \frac{600000}{v}$	b) $\frac{375}{4}v + \frac{600000}{v}$	c) $\frac{5}{16}v^2 + \frac{150000}{v}$	d) $\frac{3}{16}v + \frac{6000}{v}$	
a) $\frac{15}{16}v + \frac{600000}{v}$	b) $\frac{375}{4}v + \frac{600000}{v}$					
c) $\frac{5}{16}v^2 + \frac{150000}{v}$	d) $\frac{3}{16}v + \frac{6000}{v}$					
48.	The most economical speed to run the train is:	1				
	<table border="1"> <tr> <td>a) 18km/h</td> <td>b) 5km/h</td> </tr> <tr> <td>c) 80km/h</td> <td>d) 40km/h</td> </tr> </table>	a) 18km/h	b) 5km/h	c) 80km/h	d) 40km/h	
a) 18km/h	b) 5km/h					
c) 80km/h	d) 40km/h					
49.	The fuel cost for the train to travel 500km at the most economical speed is:	1				
	<table border="1"> <tr> <td>a) ₹ 3750</td> <td>b) ₹ 750</td> </tr> <tr> <td>c) ₹ 7500</td> <td>d) ₹ 75000</td> </tr> </table>	a) ₹ 3750	b) ₹ 750	c) ₹ 7500	d) ₹ 75000	
a) ₹ 3750	b) ₹ 750					
c) ₹ 7500	d) ₹ 75000					
50.	The total cost of the train to travel 500km at the most economical speed is:	1				
	<table border="1"> <tr> <td>a) ₹ 3750</td> <td>b) ₹ 75000</td> </tr> <tr> <td>c) ₹ 7500</td> <td>d) ₹ 15000</td> </tr> </table>	a) ₹ 3750	b) ₹ 75000	c) ₹ 7500	d) ₹ 15000	
a) ₹ 3750	b) ₹ 75000					
c) ₹ 7500	d) ₹ 15000					

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**Sample Question Paper**  
**Class XII**  
**Session 2022-23**  
**Mathematics (Code-041)**

**Time Allowed: 3 Hours**

**Maximum Marks: 80**

**General Instructions :**

1. This Question paper contains - **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 **MCQ's and 02** Assertion-Reason based questions of 1 mark each.
3. **Section B** has 5 **Very Short Answer (VSA)-type** questions of 2 marks each.
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3 marks each.
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5 marks each.
6. **Section E** has 3 **source based/case based/passage based/integrated units of assessment** (4 marks each) with sub parts.

**SECTION A**  
**(Multiple Choice Questions)**  
**Each question carries 1 mark**

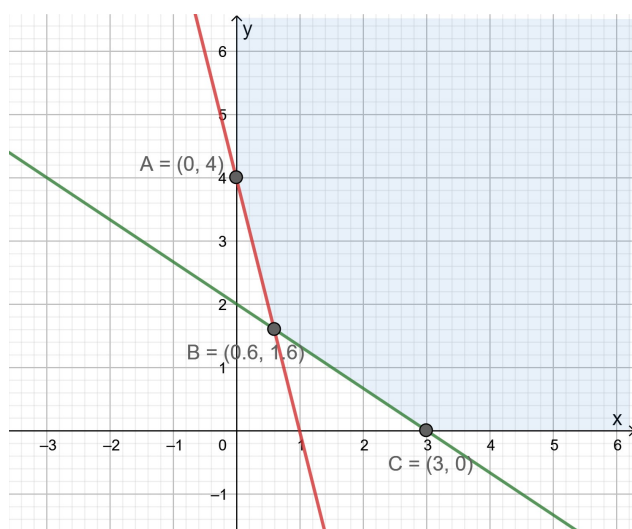
- Q1. If  $A = [a_{ij}]$  is a skew-symmetric matrix of order  $n$ , then  
(a)  $a_{ij} = \frac{1}{a_{ji}} \forall i, j$  (b)  $a_{ij} \neq 0 \forall i, j$  (c)  $a_{ij} = 0, \text{ where } i = j$  (d)  $a_{ij} \neq 0 \text{ where } i = j$
- Q2. If  $A$  is a square matrix of order 3,  $|A'| = -3$ , then  $|AA'| =$   
(a) 9 (b) -9 (c) 3 (d) -3
- Q3. The area of a triangle with vertices  $A, B, C$  is given by  
(a)  $|\vec{AB} \times \vec{AC}|$  (b)  $\frac{1}{2} |\vec{AB} \times \vec{AC}|$   
(c)  $\frac{1}{4} |\vec{AC} \times \vec{AB}|$  (d)  $\frac{1}{8} |\vec{AC} \times \vec{AB}|$
- Q4. The value of 'k' for which the function  $f(x) = \begin{cases} \frac{1-\cos 4x}{8x^2}, & \text{if } x \neq 0 \\ k, & \text{if } x = 0 \end{cases}$  is continuous at  $x = 0$  is  
(a) 0 (b) -1 (c) 1. (d) 2
- Q5. If  $f'(x) = x + \frac{1}{x}$ , then  $f(x)$  is  
(a)  $x^2 + \log |x| + C$  (b)  $\frac{x^2}{2} + \log |x| + C$  (c)  $\frac{x^2}{2} + \log |x| + C$  (d)  $\frac{x^2}{2} - \log |x| + C$
- Q6. If  $m$  and  $n$ , respectively, are the order and the degree of the differential equation  
 $\frac{d}{dx} \left[ \left( \frac{dy}{dx} \right)^4 \right] = 0$ , then  $m + n =$   
(a) 1 (b) 2 (c) 3 (d) 4
- Q7. The solution set of the inequality  $3x + 5y < 4$  is  
(a) an open half-plane not containing the origin.  
(b) an open half-plane containing the origin.  
(c) the whole  $XY$ -plane not containing the line  $3x + 5y = 4$ .  
(d) a closed half plane containing the origin.

Q8. The scalar projection of the vector  $3\hat{i} - \hat{j} - 2\hat{k}$  on the vector  $\hat{i} + 2\hat{j} - 3\hat{k}$  is  
 (a)  $\frac{7}{\sqrt{14}}$  (b)  $\frac{7}{14}$  (c)  $\frac{6}{13}$  (d)  $\frac{7}{2}$

Q9. The value of  $\int_2^3 \frac{x}{x^2+1} dx$  is  
 (a)  $\log 4$  (b)  $\log \frac{3}{2}$  (c)  $\frac{1}{2} \log 2$  (d)  $\log \frac{9}{4}$

Q10. If A, B are non-singular square matrices of the same order, then  $(AB^{-1})^{-1} =$   
 (a)  $A^{-1}B$  (b)  $A^{-1}B^{-1}$  (c)  $BA^{-1}$  (d)  $AB$

Q11. The corner points of the shaded unbounded feasible region of an LPP are (0, 4), (0.6, 1.6) and (3, 0) as shown in the figure. The minimum value of the objective function  $Z = 4x + 6y$  occurs at



- (a) (0.6, 1.6) only (b) (3, 0) only (c) (0.6, 1.6) and (3, 0) only  
 (d) at every point of the line-segment joining the points (0.6, 1.6) and (3, 0)

Q12. If  $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$ , then the possible value(s) of 'x' is/are  
 (a) 3 (b)  $\sqrt{3}$  (c)  $-\sqrt{3}$  (d)  $\sqrt{3}, -\sqrt{3}$

Q13. If A is a square matrix of order 3 and  $|A| = 5$ , then  $|adjA| =$   
 (a) 5 (b) 25 (c) 125 (d)  $\frac{1}{5}$

Q14. Given two independent events A and B such that  $P(A) = 0.3$ ,  $P(B) = 0.6$  and  $P(A' \cap B')$  is  
 (a) 0.9 (b) 0.18 (c) 0.28 (d) 0.1

Q15. The general solution of the differential equation  $ydx - xdy = 0$  is  
 (a)  $xy = C$  (b)  $x = Cy^2$  (c)  $y = Cx$  (d)  $y = Cx^2$

Q16. If  $y = \sin^{-1}x$ , then  $(1 - x^2)y_2$  is equal to  
 (a)  $xy_1$  (b)  $xy$  (c)  $xy_2$  (d)  $x^2$

Q17. If two vectors  $\vec{a}$  and  $\vec{b}$  are such that  $|\vec{a}| = 2$ ,  $|\vec{b}| = 3$  and  $\vec{a} \cdot \vec{b} = 4$ , then  $|\vec{a} - 2\vec{b}|$  is equal to

- (a)  $\sqrt{2}$       (b)  $2\sqrt{6}$       (c) 24      (d)  $2\sqrt{2}$

Q18. P is a point on the line joining the points  $A(0,5,-2)$  and  $B(3,-1,2)$ . If the x-coordinate of P is 6, then its z-coordinate is

- (a) 10      (b) 6      (c) -6      (d) -10

### ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.  
 (b) Both A and R are true but R is not the correct explanation of A.  
 (c) A is true but R is false.  
 (d) A is false but R is true.

Q19. **Assertion (A):** The domain of the function  $\sec^{-1}2x$  is  $(-\infty, -\frac{1}{2}] \cup [\frac{1}{2}, \infty)$

**Reason (R):**  $\sec^{-1}(-2) = -\frac{\pi}{4}$

Q20. **Assertion (A):** The acute angle between the line  $\vec{r} = \hat{i} + \hat{j} + 2\hat{k} + \lambda(\hat{i} - \hat{j})$  and the x-axis is  $\frac{\pi}{4}$

**Reason(R):** The acute angle  $\theta$  between the lines

$$\vec{r} = x_1\hat{i} + y_1\hat{j} + z_1\hat{k} + \lambda(a_1\hat{i} + b_1\hat{j} + c_1\hat{k}) \text{ and}$$

$$\vec{r} = x_2\hat{i} + y_2\hat{j} + z_2\hat{k} + \mu(a_2\hat{i} + b_2\hat{j} + c_2\hat{k}) \text{ is given by } \cos\theta = \frac{|a_1a_2 + b_1b_2 + c_1c_2|}{\sqrt{a_1^2 + b_1^2 + c_1^2} \sqrt{a_2^2 + b_2^2 + c_2^2}}$$

### SECTION B

*This section comprises of very short answer type-questions (VSA) of 2 marks each*

Q21. Find the value of  $\sin^{-1}[\sin(\frac{13\pi}{7})]$

OR

Prove that the function f is surjective, where  $f: N \rightarrow N$  such that

$$f(n) = \begin{cases} \frac{n+1}{2}, & \text{if } n \text{ is odd} \\ \frac{n}{2}, & \text{if } n \text{ is even} \end{cases}$$

Is the function injective? Justify your answer.

Q22. A man 1.6 m tall walks at the rate of 0.3 m/sec away from a street light that is 4 m above the ground. At what rate is the tip of his shadow moving? At what rate is his shadow lengthening?

Q23. If  $\vec{a} = \hat{i} - \hat{j} + 7\hat{k}$  and  $\vec{b} = 5\hat{i} - \hat{j} + \lambda\hat{k}$ , then find the value of  $\lambda$  so that the vectors  $\vec{a} + \vec{b}$  and  $\vec{a} - \vec{b}$  are orthogonal.

OR

Find the direction ratio and direction cosines of a line parallel to the line whose equations are

$$6x - 12 = 3y + 9 = 2z - 2$$

Q24. If  $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$ , then prove that  $\frac{dy}{dx} = -\sqrt{\frac{1-y^2}{1-x^2}}$

Q25. Find  $|\vec{x}|$  if  $(\vec{x} - \vec{a}) \cdot (\vec{x} + \vec{a}) = 12$ , where  $\vec{a}$  is a unit vector.

### SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

Q26. Find:  $\int \frac{dx}{\sqrt{3-2x-x^2}}$

Q27. Three friends go for coffee. They decide who will pay the bill, by each tossing a coin and then letting the “odd person” pay. There is no odd person if all three tosses produce the same result. If there is no odd person in the first round, they make a second round of tosses and they continue to do so until there is an odd person. What is the probability that exactly three rounds of tosses are made?

OR

Find the mean number of defective items in a sample of two items drawn one-by-one without replacement from an urn containing 6 items, which include 2 defective items. Assume that the items are identical in shape and size.

Q28. Evaluate:  $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\tan x}}$

OR

Evaluate:  $\int_0^4 |x-1| dx$

Q29. Solve the differential equation:  $ydx + (x - y^2)dy = 0$

OR

Solve the differential equation:  $xdy - ydx = \sqrt{x^2 + y^2} dx$

Q30. Solve the following Linear Programming Problem graphically:

Maximize  $Z = 400x + 300y$  subject to  $x + y \leq 200, x \leq 40, x \geq 20, y \geq 0$

Q31. Find  $\int \frac{(x^3+x+1)}{(x^2-1)} dx$

### SECTION D

(This section comprises of long answer-type questions (LA) of 5 marks each)

Q32. Make a rough sketch of the region  $\{(x, y): 0 \leq y \leq x^2, 0 \leq y \leq x, 0 \leq x \leq 2\}$  and find the area of the region using integration.

Q33. Define the relation R in the set  $N \times N$  as follows:

For  $(a, b), (c, d) \in N \times N$ ,  $(a, b) R (c, d)$  iff  $ad = bc$ . Prove that R is an equivalence relation in  $N \times N$ .

OR

Given a non-empty set  $X$ , define the relation  $R$  in  $P(X)$  as follows:

For  $A, B \in P(X)$ ,  $(A, B) \in R$  iff  $A \subset B$ . Prove that  $R$  is reflexive, transitive and not symmetric.

- Q34. An insect is crawling along the line  $\vec{r} = 6\hat{i} + 2\hat{j} + 2\hat{k} + \lambda(\hat{i} - 2\hat{j} + 2\hat{k})$  and another insect is crawling along the line  $\vec{r} = -4\hat{i} - \hat{k} + \mu(3\hat{i} - 2\hat{j} - 2\hat{k})$ . At what points on the lines should they reach so that the distance between them is the shortest? Find the shortest possible distance between them.

OR

The equations of motion of a rocket are:

$x = 2t, y = -4t, z = 4t$ , where the time  $t$  is given in seconds, and the coordinates of a moving point in km. What is the path of the rocket? At what distances will the rocket be from the starting point  $O(0, 0, 0)$  and from the following line in 10 seconds?

$$\vec{r} = 20\hat{i} - 10\hat{j} + 40\hat{k} + \mu(10\hat{i} - 20\hat{j} + 10\hat{k})$$

- Q35. If  $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$ , find  $A^{-1}$ . Use  $A^{-1}$  to solve the following system of equations  
 $2x - 3y + 5z = 11, 3x + 2y - 4z = -5, x + y - 2z = -3$

### SECTION E

(This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub-parts of 2 marks each.)

- Q36. **Case-Study 1:** Read the following passage and answer the questions given below.



The temperature of a person during an intestinal illness is given by  $f(x) = -0.1x^2 + mx + 98.6, 0 \leq x \leq 12$ ,  $m$  being a constant, where  $f(x)$  is the temperature in  $^{\circ}\text{F}$  at  $x$  days.

- Is the function differentiable in the interval  $(0, 12)$ ? Justify your answer.
- If 6 is the critical point of the function, then find the value of the constant  $m$ .

- (iii) Find the intervals in which the function is strictly increasing/strictly decreasing.

OR

- (iii) Find the points of local maximum/local minimum, if any, in the interval  $(0, 12)$  as well as the points of absolute maximum/absolute minimum in the interval  $[0, 12]$ . Also, find the corresponding local maximum/local minimum and the absolute maximum/absolute minimum values of the function.

Q37. **Case-Study 2:** Read the following passage and answer the questions given below.



In an elliptical sport field the authority wants to design a rectangular soccer field with the maximum possible area. The sport field is given by the graph of

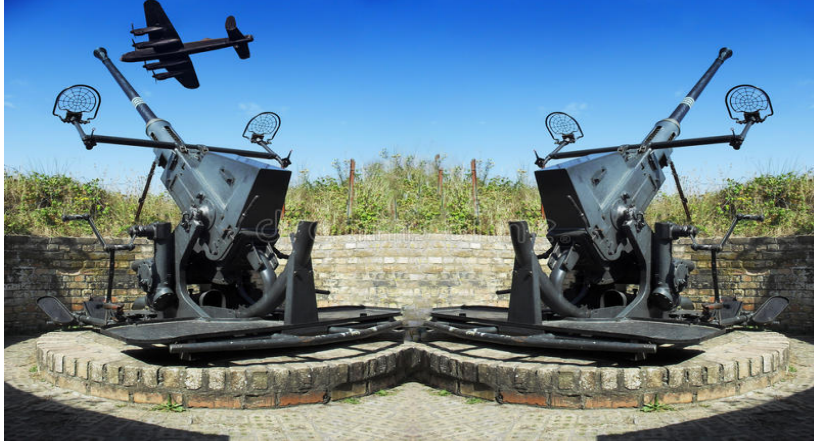
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

- (i) If the length and the breadth of the rectangular field be  $2x$  and  $2y$  respectively, then find the area function in terms of  $x$ .
- (ii) Find the critical point of the function.
- (iii) Use First derivative Test to find the length  $2x$  and width  $2y$  of the soccer field (in terms of  $a$  and  $b$ ) that maximize its area.

OR

- (iii) Use Second Derivative Test to find the length  $2x$  and width  $2y$  of the soccer field (in terms of  $a$  and  $b$ ) that maximize its area.

Q38. **Case-Study 3:** Read the following passage and answer the questions given below.



There are two anti-aircraft guns, named as A and B. The probabilities that the shell fired from them hits an airplane are 0.3 and 0.2 respectively. Both of them fired one shell at an airplane at the same time.

- (i) What is the probability that the shell fired from exactly one of them hit the plane?
- (ii) If it is known that the shell fired from exactly one of them hit the plane, then what is the probability that it was fired from B?

## Sample Paper 2

Class X Exam 2022-23

English-Language and Literature (184)

Time Allowed : 3 Hrs.

Maximum Marks: 80

### General Instructions:

1. 15-minute prior reading time allotted for Q-paper reading.
  2. The Question Paper contains THREE sections READING, GRAMMAR & WRITING and LITERATURE.
  3. Attempt question based on specific instructions for each part.
- 

### SECTION A- READING SKILLS

20

#### I. Read the passage given below.

10

1. Over the past few decades, research has revealed a great deal of information about how readers get meaning from what they read and about the kinds of instructional activities and procedures that are most successful in helping students to become good readers. For many years, reading instruction was based on a concept of reading as the application of a set of isolated skills such as identifying words, finding main ideas, identifying cause and effect relationships, comparing and contrasting and sequencing. Comprehension was viewed as the mastery of these skills.
2. One important classroom study conducted during the 1970s found that typical comprehension instruction followed what the study called a mentioning, practicing, and assessing procedure. That is, teachers mentioned a specific skill that students were to apply, had students practice the skill by completing workbook pages, then assessed them to find out if they could use the skill correctly. Such instruction did little to help students learn how or when to use the skills, nor was it ever established that this particular set of skills enabled comprehension.
3. At about this time, a group of psychologists, linguists, and computer scientists began to focus research attention on how the mind works — how people think and learn. A goal of this new research movement, called cognitive science, was to produce an applied science of learning.
4. In the field of reading, a number of cognitive scientists focused their attention on how readers construct meaning as they read. Specifically, they studied the mental activities that good readers engage in to achieve comprehension. From these studies an entirely new concept emerged about what reading is. According to the new concept, reading is a complex, active process of constructing meaning - not skill application.

The act of constructing meaning is :

**Interactive** - it involves not just the reader but also the text and the context in which reading takes place.

**Strategic** - readers have purposes for their reading and use a variety of strategies and skills as they construct meaning.

**Adaptable** - readers change the strategies they use as they read different kinds of text or as they read for different purposes.

5. While cognitive science research was producing valuable information about comprehension processes, reading education researchers were reporting important findings about what comprehension instruction looks like in the most effective reading classrooms.



6. The convergence of these strands of research has provided a wealth of information about what good readers do as they read, about how good and poor readers differ, and about the kind of instruction that is needed to help students to become good readers.

**Based on your understanding of the passage, answer the questions given below.**

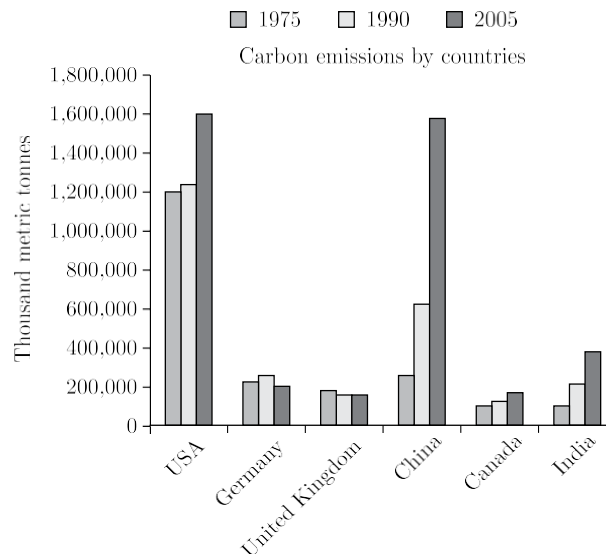
- i. Which of the following is not a procedure that followed a typical comprehension instruction during the 1970s, as revealed after a classroom study done by researchers ?
- (a) practicing procedure
  - (b) mentioning procedure
  - (c) memorisation procedure
  - (d) assessing procedure
- ii. A number of cognitive scientists, in the field of reading, focused their attention on :
- (a) how much an average reader can read in a day.
  - (b) learning why many people preferred learning through reading.
  - (c) learning why readers had a much better knowledge of vocabulary than others.
  - (d) how readers construct meaning as they read.
- iii. Supply 1 point to justify the following:  
Readers change the strategies they use.
- iv. Select the appropriate option to fill in the blanks:  
According to the new concept of reading, reading is not \_\_\_\_\_ but a complex, active process of constructing meaning.
- (a) an insignificant expertise
  - (b) a comprehension skill
  - (c) a skill application
  - (d) a preferred ability
- v. The act of constructing meaning is :
- I. Comprehensive
  - II. Adaptable
  - III. Strategic
  - IV. Interactive
- (a) I, II and III
  - (b) I, III and IV
  - (c) II, III and IV
  - (d) I, II, III and IV
- vi. Which instruction gave no help to the students to learn how or when to use certain skills nor was it ever established that this particular set of skills enabled comprehension?

- vii. State whether the following statement is TRUE or FALSE:  
In the late 20th century a group of psychologists, linguists, and computer scientists began to focus research attention on how the mind works i.e. how people think and learn.
- viii. Complete the following analogy correctly with a word/phrase from paragraph 3:  
bow : obeisance :: objective : \_\_\_\_\_  
(Clue : A bow is a synonym for an obeisance, similarly an objective is a synonym for a...)
- ix. Choose an option that clearly states the meaning of the word ‘convergence’.
  - (a) two or more things become similar or come together
  - (b) two thoughts or things going parallelly
  - (c) the emergence of new and distinct thoughts or patterns
  - (d) the violent mixing of two or more things
- x. For many years, reading instruction was based on a concept of reading as the application of a set of isolated skills.  
List any two such isolated skills.
  1. \_\_\_\_\_
  2. \_\_\_\_\_

**II. Read the passage given below.**

**10**

- 1. The chart given below provides information about the amount of carbon emissions in different countries during three different years (1975, 1990, and 2005).



- 2. The bar chart compares the emission of carbon dioxide into the atmosphere of six countries, including two of them coming from emerging nations, for three decades starting from 1975 until 2005.
- 3. As an overall assessment, it can clearly be seen that only Germany and United Kingdom managed to reduce the carbon emissions compared to the other countries.

4. USA, being the number one polluter of all, emitted 1,200,000 thousand metric tonnes in 1975 and this count increased to 1,300,000 and 1,600,000 thousand metric tonnes in 1990 and 2005 respectively. In contrast, the carbon emissions of China was nearly 300,000 thousand metric tonnes in 1975 and it rose by nearly 100% in 1990 and surged dramatically to just below 1,600,000 thousand metric tonnes in 2005. In terms of the percentage increase, China was the largest contributor in carbon emissions of all.
5. The figures for Germany and the United Kingdom remained relatively stable throughout the period of time, and so were for Canada until 1990. The carbon dioxide emissions in India increased exponentially from around 100,000 in 1975 to just below 400,000 thousand metric tonnes in 2005.

**Based on your understanding of the passage, answer the questions given below.**

- i. The data given in the graph compares the amount of emission of \_\_\_\_\_.  
(a) nitrogen  
(b) carbon dioxide  
(c) oxygen  
(d) none of these
- ii. Which country was the largest contributor in carbon emissions of all in year 2005 in terms of percentage increase?
- iii. According to the passage, which country is the most polluter country?  
(a) India  
(b) China  
(c) USA  
(d) Germany
- iv. Infer one reason for the following, based on information in the passage:  
Surging of CO<sub>2</sub> emission in million tonnes.
- v. Which country has the lowest emission of CO<sub>2</sub> in the graph?  
(a) Germany  
(b) United Kingdom  
(c) Canada  
(d) India
- vi. Which country has observed a dramatic rise over the years in CO<sub>2</sub> emission?  
(a) India  
(b) China  
(c) USA  
(d) Germany

- vii. Substitute the word 'nearly' with ONE WORD similar in meaning, in the following sentence from paragraph 4:  
The carbon emissions of China was nearly 300,000 thousand metric tonnes in 1975 and it rose...
- viii. Name two countries which had the same level of CO<sub>2</sub> emission in the first and the second decade?  
1. \_\_\_\_\_  
2. \_\_\_\_\_
- ix. State whether the following statement is TRUE or FALSE:  
The countries have achieved meteoric rise in CO<sub>2</sub> emission.
- x. Which of the following countries reported gradual growth in reduction of global CO<sub>2</sub> emission?  
(a) Germany and India  
(b) USA and China  
(c) The United Kingdom and USA  
(d) Germany and The United Kingdom

**III. SECTION B- GRAMMAR 10**

**Attempt ANY TEN of the following questions. 10**

- i. Fill in the blank by choosing the correct option to complete the sentence.  
If we \_\_\_\_\_ one more batsman in our team, we would have won the match.  
(a) had had  
(b) would have been  
(c) would have  
(d) would have had
- ii. Read the conversation between Reena and Rakesh. Complete the sentence by reporting Rakesh's reply correctly.  
Reena : Have you seen 'Three Idiots'?  
Rakesh : I saw them yesterday in my class.  
Reena asked Rakesh if he had seen 'Three Idiots'. Rakesh replied that \_\_\_\_\_.
- iii. Select the correct option to fill in the blank for the given line.  
The swimmer was tired but he \_\_\_\_\_ reach the shore before he collapsed.  
(a) will  
(b) could  
(c) may  
(d) must

- iv. Select the option identifies the error and supplies the correction for the following line:  
Have you ever learn from a mistake you have made?

Option No.	Error	Correction
(a)	learn	learnt
(b)	Have	Has
(c)	a	the
(d)	made	make

- v. Complete the given sentence, by filling in the blank with the correct option :  
I bought a new car last year, but I \_\_\_\_\_ my old car yet, so at present I have two cars.

- (a) sell  
(b) have not sold  
(c) sold  
(d) did not sell

- vi. Fill in the blank by using the correct form of the word in the bracket.  
Neither you nor your sister should \_\_\_\_\_ (talk) to them.

- vii. Report the dialogue between Sanjay and Madan, by completing the sentence :  
Sanjay: I am surprised to see you here in Delhi. When did you come?  
Madan: I came here yesterday. I have been offered a job here.

Sanjay told Madan that he was surprised to see him there in Delhi and asked when he had come. Madam replied that he had come there the previous day and added that \_\_\_\_\_.

- viii. Identify the error in the given sentence and supply the correction.  
A good business letter is one that get results.

Use the given format for your response.

Error	Correction

- ix. Transform the following direct speech into reported speech:  
He said, "Reena, do you want to buy a house in Noida?"

- x. Fill in the blank by choosing the correct option, to complete the sentence.  
He said I \_\_\_\_\_ use his car whenever I wanted.

- (a) will  
(b) would  
(c) could  
(d) can

- xi. Ram and Shyam are discussing their plans for the weekend. Fill in the blank to complete the dialogue below by choosing the correct options.

Ram: What are you doing this weekend, shyam?

Shyam: I don't have any special plan.

Ram: How do you like the idea\_\_\_\_\_.

- (a) of go for a picnic to the Dal Lake?  
 (b) of going for a picnic to the Dal Lake?  
 (c) of went for a picnic to the Dal Lake?  
 (d) of going for a picnic by the Dal Lake?
- xii. Identify the error and supply the correction, for the following sentence:  
 Every trees have a single woody stem called a trunk which supports a mass of branches carrying leaves.

Use the given format for your response.

Error	Correction

**IV. SECTION B- CREATIVE WRITING SKILLS 10**

*All the names and addresses used in the questions are fictitious. Resemblance, if any, is purely coincidental.*

1. Attempt **ANY ONE** from A and B given below. **5**
- A. You are Praveen of 23, Civil Lines, Jaipur. Write a letter to the Editor of Dainik Bhaskar, Jaipur about frequent break-down of electricity.

**Or**

- B. You have seen an advertisement of a new model sports bike launched by Honda. You are a passionate racer and are keen to buy the new model of racing bikes being offered. Next month a zonal level Bike Marathon is taking place and you are keen to enroll your name as a contestant. Write a letter to M/s Honda Bikes and Scooters, Kashmere Gate, New Delhi enquiring about the price, specifications and availability of accessories that long distance racers would require. You are Man Singh living in Green Park, New Delhi.

2. Attempt **ANY ONE** from A and B given below. **5**
- A. You are Suresh/Lalita. Given below is a table based on data given about the number of tourists who visited your city in the past two years. Write an analytical paragraph on 'Promotion of Tourism' taking information from the table given below together with your own ideas in 100-120 words.

Year	Tourists Who Visited	
	Domestic	International
2020	444569	8563
2021	436350	11478

**Plans of Tourism Department:**

- To develop a wildlife park.
- Illumination and light and sound programme at one of the places of tourist interest in the city.
- To develop a big amusement park.
- Convention centre and a multiplex in the city.

**Or**

- B.** You are the Head Boy/Head Girl of your school. You decided to make the school population aware of the advantages of tree plantation and tell them how trees can serve as better air-conditioners. Write an analytical paragraph in 100-120 words. Take help of the cues given below.

**Cues :**

Trees keep environment cool by

- taking heat of earth and air
- absorbing carbon-dioxide that helps in controlling temperature rise
- bringing rains
- checking direct sunlight
- providing shade

**SECTION C- LITERATURE****40****V. Reference to the Context****10****1. Attempt ANY ONE of two extracts given.****5**

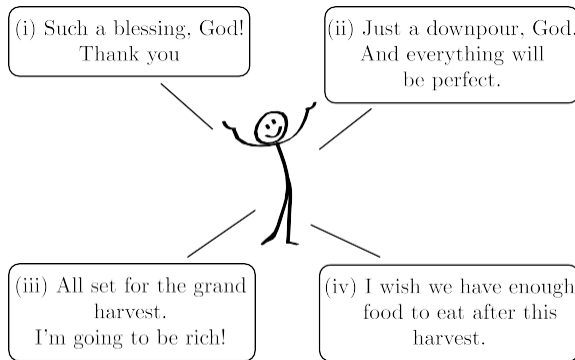
- 1.A** The house- the only one in the entire valley- sat on the crest of a low hill. From this height one could see the river and the field of ripe corn dotted with the flowers that always promised a good harvest. The only thing the earth needed was a good downpour or at least a shower. Throughout the morning Lencho - who knew his fields intimately- had done nothing but see the sky towards the north-east.

*(A Letter to God)*

- i.** Where was Lencho's house located?
- ii.** The field of corn dotted with flowers means that
  - (a) not a single flower was bigger than a dot
  - (b) the flowers were scattered across.
  - (c) the flowers were in shaped like dots.
  - (d) the flowers had shrunk in size.
- iii.** Find the word from the passage which means 'very closely'.

Continue on next page.....

iv. Based on the given extract, what is Lencho not likely to think while looking at his field?



- (a) Option (i)
- (b) Option (ii)
- (c) Option (iii)
- (d) Option (iv)

v. Which quote supports the idea in the given extract?

- (a) "Farming is a profession of hope."
- (b) "I would rather be on my farm than be emperor of the world."
- (c) "Farming looks mighty easy when your plough is a pencil, and you're a thousand miles from the corn field."
- (d) "Those too lazy to plough in the right season will have no food at the harvest."

Or

1.B The two boys started in surprise at the fresh muddy imprints of a pair of bare feet. What was a barefooted man doing on the steps of a house in the middle of London? And where was the man? As they gazed, a remarkable sight met their eyes. A fresh footmark appeared from nowhere! Further footprints followed, one after another, descending the steps and progressing down the street. The boys followed, fascinated, until the muddy impressions became fainter and fainter, and at last disappeared altogether.

*(Footprints Without Feet)*

i. Infer one reason for the following, based on information in the extract.

The boys were surprised to see a barefooted man in London.

ii. Complete the analogy by selecting the suitable word from the text.

partition : divide :: conjugate : \_\_\_\_\_

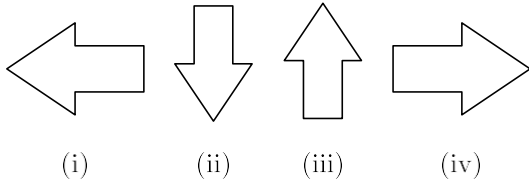
*(Clue : To partition means to divide, similarly to conjugate means to...)*

iii. Pick the option that best describes how the boys are feeling based on the extract.

- (a) enchanted, curious, puzzled
- (b) captivated, curious, puzzled
- (c) repulsed, curious, captivated
- (d) enchanted, repulsed, curious



- iv. The boys felt that the footprints were
- (a) seen due to some magic trick.
  - (b) a figment of imagination.
  - (c) of a man who was invisible.
  - (d) those of a mysterious man.
- v. Pick the option that lists the correct direction of the footprints on the stairs, as noticed by the boys.



- (a) option (i)
- (b) option (ii)
- (c) option (iii)
- (d) option (iv)

2. Attempt ANY ONE of two extracts given.

5

2.A Has given my heart  
A change of mood  
And saved some part  
Of a day I had rued.

(Dust of Snow)

- i. How does the poet feel now?
- (a) Ecstatic
  - (b) Pessimistic
  - (c) Reckless
  - (d) Despondent
- ii. What does the poem Dust of Snow teach us?
- iii. Which poetic device has been used in 'And saved some part'?
- (a) Assonance
  - (b) Personification
  - (c) Alliteration
  - (d) Enjambment

Continue on next page.....

- iv. What does the word 'Rued' mean?
- (a) Feel happy
  - (b) Feel remorse for
  - (c) Feel ravishing
  - (d) Feels on the top of the world
- v. Fill in the blank with suitable poetic device.  
\_\_\_\_\_ has been used in 'Has given my heart'.

Or

2.B But I can get a hair-dye  
And set such colour there,  
Brown, or black, or carrot,  
That young men in despair  
May love me for myself alone  
And not my yellow hair.

(For Anne Gregory)

- i. Given below are the taglines of four hypothetical brands. Choose the correct option that fits the best with the first three lines of the given stanza.
- 1. LITELIFE  
Food that makes you light.
  - 2. GET SET  
My home. My gym.
  - 3. LOOKBOOK  
No game over, get makeover.
  - 4. PLANET FOOD  
Eat! Eat! Eat! Repeat!
- (a) Option 1
  - (b) Option 2
  - (c) Option 3
  - (d) Option 4
- ii. The form of the given stanza is a part of
- (a) an agreement.
  - (b) a disapproval.
  - (c) an engagement.
  - (d) an argument.
- iii. Infer one reason for the following, based on information in the passage:  
Anne says that she can change her hair colour.

- iv. State whether the following statement is TRUE or FALSE:  
The speaker wants to change her hair colour so that it may appeal to young men.
- v. Choose the product that best shows what Anne would invest in, to ensure that young men love her for herself and not her hair.



- (a) Option 1  
(b) Option 2  
(c) Option 3  
(d) Option 4

**VI Answer ANY FOUR of the following in about 40-50 words each.**

**4 # 3 = 12**

- i. Nelson Mandela speaks of twin obligations. What are they?  
(Nelson Mandela - Long Walk to Freedom)
- ii. What does Anne write in the diary about herself and her sister ?  
(From the Diary of Anne Frank)
- iii. How did the Buddha teach Kisa Gotami the truth of life?  
(The Sermon at Benares)
- iv. How did Belinda, Ink, Blink and Mustard react on seeing the pirate ?  
(The Tale of Custard the Dragon)
- v. The tigers in the poem 'A Tiger in the Zoo' has some obvious limitations, describe them in contrast to its natural habitat.

**VII Answer ANY TWO of the following in about 40-50 words each.**

**2 # 3 = 6**

- i. Why did Hari Singh think that Anil's job was queer?  
(The Thief's Story)
- ii. Why did Horace Danby feel sure of his success in that year's robbery?  
(A Question of Trust)
- iii. Which character traits of Bholi have had an everlasting impression on you? Why?  
(Bholi)

**VIII Answer ANY ONE of the following in about 100-120 words.**

**6**

- i. One is known by one's roots. The people of Coorg are also recognized for their values and traits in spite of being thousands of miles away from their places of origin-Greece and Arabia. Describe their values and traits.  
(Glimpses of India)

**Or**

- ii. If the Buddha were to summarise the life lessons of 'the Ball poem' what would that sermon be? Think and create this address for people of your age.

**IX** Answer ANY ONE of the following in about 100-120 words.

**6**

- i. Not to accept the limitations of our life makes us unhappy in our lives. Describe how Matilda Loisel suffers in her life because she does not accept that she is not a rich person.

(The Necklace)

**Or**

- ii. Give a brief character sketch of Fowler ? What are the values reflected in his character?

(The Midnight Visitor)

□□□□□

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**WOODLAND OVERSEAS SCHOOL**

**An International School**

**Scholarship Cum 1<sup>st</sup> Pre Board Examination (Session: 2022 - 2023)**

**Grade - 12**

**Subject – English Core**

**Subject Code: 301**

**Date: 1<sup>st</sup> December, 2022**

**Time: 3 Hours + 15 Minutes**

**M.M. 80**

**General Instructions:**

- 1) The Question Paper contains three sections A, B and C. All the sections are compulsory.
- 2) Read all the instructions carefully and follow them faithfully.
- 3) Do not exceed the prescribed word limit while answering the questions.

**Section- A**

**READING**

**1. Read the passage carefully and answer the questions that follow:**

10

- i. Academics has always been an essential part of human development. It prepares us to survive in the outside world and establish an identity of our own. But, is an individual's development restricted to merely academics? In India, from an early age, we have been taught that education is limited to the boundaries of academics only; the idea of getting out into the field, for gaining practical experience, is always considered a hoax. This has hindered students' development. But the truth is that education represents a considerably broader field than we know of it. Our teaching, from the basics, has been focused on getting good grades and job offers, rather than being creative and unique.
- ii. In the 21st century, the pure academics type of education is slowly paving way for a whole new type. The paradigm shift in the whole education system is evident. People have now come to understand that education is a 360 degree activity that should focus on students' overall development, rather than restricting them to the classroom.
- iii. Co-curricular activities that take place outside the classroom but reinforce or supplement classroom curriculum, in some way, have become a point of focus today. Such activities help in the growth of the child, in more than one way. Participating in these activities helps the youngsters grow mentally and emotionally, socially and individually. Intellectual development of a student may take place in the classroom, but for the aesthetic development, such as team-building, character building and physical growth, a student must step out into the outside world. For instance, if a student is a part of school football team, he/she will learn team-work and coordination, in a practical manner, which cannot be taught in the class.
- iv. Similarly, in colleges and institutions, there is a need for practical exposure so that the students can experience the actual working of the industry. For example, taking a student to a manufacturing firm will give him/her the real insight and better learning of the industry. Catering to this change, most professional colleges, including B-schools, have started providing practical exposure to students through regular guest lectures, industrial visits, conferences, seminars, cultural festivals and so on. With industry visits, students are able to better identify their prospective areas of work in the overall organisational function. Moreover, they help enhance interpersonal skills and communication techniques. In addition, guest lectures are equally important for all-round development of students. It is a great way for students to gain maximum exposure, as the guest speakers talk about their real life experiences and not what is there in the textbooks.
- v. Through such events, students are made to participate and coordinate different events wherein they get to know how exactly things are managed. Classroom teaching provides the foundation and cocurricular activities provide practical exposure and opportunities to implement what students learn in the classroom. This helps in developing the overall personality of an individual,

inculcating various soft-skills in them, which otherwise are difficult to teach. Clearly, life beyond academics creates creative and empowered professionals.

**Based on your understanding of the above passage, answer the following questions by choosing the most appropriate option.**

- i) Students' development is hindered by:  
 a) limiting education to academics boundaries      b) getting out to the field  
 c) being creative and unique                              d) gaining practical knowledge
- ii) The shift in the education system means:  
 a) to restrict to classroom activities                      b) to focus on academic development  
 c) to ignore 360 degree activity                          d) to focus on overall development
- iii) Co-curricular activities that take place outside the classroom may not help in:  
 a) team work and coordination                          b) mental and social growth  
 c) intellectual development                                d) character building
- iv) Guest speakers talk about:  
 (A) all-round development                                (B) their real life experiences  
 (C) what is in textbooks                                    (D) gaining exposure  
 a) A only    b) B only  
 c) C only    d) C and D
- v) **Classroom teaching provides:**  
 a) practical exposure  
 b) opportunities to implement what is learnt in classroom  
 c) chance to learn soft-skills  
 d) the foundation
- vi) **Life beyond academics facilitates:**  
 a) organisational functions                                b) creativity  
 c) professional fields                                        d) industrial visits
- vii) From earlier times, what has not been the focus of education?
- |                                     |  |
|-------------------------------------|--|
| Getting good marks                  | Getting job offer                                |
| Option A                            | Option B   |
| Idea of gaining practical knowledge | Individual's development restricted to academics |
| Option C                            | Option D   |
- a) Option A    b) Option B  
 c) Option C    d) Option D
- viii) For aesthetic development, students should:  
 a) go to art galleries  
 b) go to cinema halls and watch movies  
 c) be in the company of artists  
 d) move out of the classroom and participate in outdoor games
- ix) To get a better insight into industry, students should:  
 a) read books on industry                                b) work hard in industry  
 c) visit industry    d) None of the above
- x) What kind of co-curricular activities have become points of focus today?  
 a) Activities which help in scoring good grades  
 b) Activities outside classroom which supplement classroom curriculum in some way  
 c) The pure academic activities  
 d) None of the above

2. **Based on your understanding of the passage, answer the questions given below:**

10

- i. The word "lynching" in fact originated in the United States in the mid-18th century. The term was first believed to be used by planter Charles Lynch to describe extra-judicial authority assumed by private individuals. It came to be applied over time to extra-judicial killings by crowds.



- xi) In the passage alien concept' means an idea:  
 a) not belonging to one's own country                      b) belonging to one's own country  
 c) belonging to supernatural powers                      d) belonging to heaven
- x) People have been lynched for:  
 a) riding a horse    b) growing a moustache  
 c) building a two-storey home    d) All of the above

**Section- B**

**WRITING**

3. **Attempt any one from A and B given below:** 5

A) You are Sudeep / Neha, students union advisor of ARJ Public School, Kolkata. Write an election notice inviting nominations for the post of President, Secretary and Treasurer of the students' Union. Give all the necessary details.

**OR**

B) You are Josely Mathew, the President of the school book club. The club is organizing a drive for promoting reuse of study material and books. Draft a notice in about 50 words, for the school notice board, addressing students of classes 10 and 12, informing them about this drive and urging them to contribute to the endeavor mention how donated books would benefits a charitable cause.

4. **Attempt any one from A and B given below:** 5

A) Your school is planning to organize a talk on 'The Importance of Promoting Art Education' at all levels. You plan to invite the Director, Delhi School of Art as the keynote speaker. As CCA, Coordinator of Vidya Mandir Vidyalaya, draft a formal invitation for the same, giving all the necessary details.

**OR**

B) You are A.K. Serohi, an eminent educationist. You have been invited to preside over an Inter-regional Debate Competition by Sudheep, the President of English Literary Club of St. Lukes Convent School, Kankerkhera Meerut. Write a formal reply accepting the invitation.

5. **Attempt any one from A and B given below:** 5

A) You are Prakriti / Prabhat, a resident of college Road, Bhopal. You see the following advertisement in the newspaper, for the job of a 'Marketing Officer' in Chaitanya Enterprises, Mumbai. Write an application with detailed biodata to the Public Relations Officer of the firm.

Chaitanya Enterprises requires an experienced Marketing Officer for its Mumbai branch.

**The applicant must have:**

B.Sc. / B.A. in Marketing

6+ years experience

**Addition skills:**

Effective written and communication skills

Thorough understanding of marketing techniques and principles.

Knowledge of MS Office, social media and web analytics.

Apply to Sunil Baweja, Public Relations Officer.

**OR**

B) It gives you a good feeling when you read in the newspaper how patients from abroad come to hospitals in India and get themselves treated at a fraction of expenses they would have incurred elsewhere. Write a letter in 120-150 words to the editor of national daily describing the importance of medical tourism for India. You are Karan / Karuna M-114, Mall road Kanpur.

6. **Attempt any one from A and B given below:** 5

A) While reading about new places and searching for them online has its merits, the advantages of actually travelling to various destinations far exceed them. Write an article for the magazine Travel Times, evaluating both these options. You may use the cues given below along with your own ideas. You are Amrit / Amrita.



- Builds Confidence
- Make friends and memories
- Experience new cultures
- Expands knowledge

**OR**

B) The eminent psychologist, Dr. Madhumita was invited by your school authorities to speak to the students on the topic ‘How to maintain robust mental health? She delivered a lively speech without using any medical technical term. After the lecture the students asked many questions especially about how to cope with stress during examinations. Dr. Madhumita addressed their concerns very patiently and gave them some very useful tips. Write a report for your school magazine describing the session with the psychologist. You are Nimit / Naina head boy /head girl, National School, Sonipat.

**Section- C**

**LITERATURE**

7.1 **Read the given extract to attempt the questions with reference to context. Attempt any one of two extracts.** 6

It is in the news that all these pitiful kin  
 are to be bought out and mercifully gathered in  
 to live in villages, next to the theatre and the store,  
 while greedy good doors, beneficent beasts of prey  
 swarm over their lives enforcing benefits  
 that are calculated to soothe them out of their wits,  
 and by teaching them how to sleep they sleep all days,  
 destroy their sleeping at night the ancient way.

- What is the tone of the poet in the above lines?
- Identify the phrase from the extract, that suggests the following:  
 ‘No one bother to take their consent before pushing the promise of a better life, their way.
- What quality of villagers can be inferred through these lines?  
 a) gullible      b) futuristic      c) hypocritical      d) ambitious
- What promise is made to these villagers?
- On the basis of the extract, choose the correct option with reference to (1) and (2) given below:  
 (1) The city dwellers make promise for the betterment of the villagers.  
 (2) The city dwellers have ulterior motives.  
 a) (1) is true but (2) is false  
 b) (2) is true but (1) is false  
 c) (2) is the reason for (1)  
 d) Both (1) and (2) cannot be inferred from the extract.
- Fill in the blank with an appropriate word, with reference to the extract.  
 “\_\_\_\_\_calculated to soothe them out of their wits” implies that ‘them’ are being\_\_\_\_\_.

**OR**

Therefore on every morrow, are we wreathing  
 A flowery band to bind us to the earth  
 spite of despondence of the inhuman dearth  
 of noble natures, of the gloomy days,  
 of all the unhealthy and o’er darkened ways  
 Made for our searching.

- What do we do ‘every morrow’?  
 i) go to temple and worship god      ii) go for a walk  
 iii) build a house      iv) None of the above
- Why do we ‘wreath a flowery band’?  
 i) to present it to someone dear      ii) to lay it on the dead body of a celebrity  
 iii) to stay connected with mother earth      iv) None of the above

- c) 'Spite' of despondence means:
- |                                  |                    |
|----------------------------------|--------------------|
| i) ill will and hatred for other | ii) sickness       |
| iii) nobleness of man            | iv) a state of joy |
- d) Give a synonym of 'death'.
- e) What does the phrase 'spite of despondence' mean?
- f) Give a suitable title to the extract.

7.2 **Attempt any one of the two extracts given below:**

6

"It was his horror of being lionized which made him thus repel would be acquaintances, interviewers and the persistent petitioners for his autograph and would afterwards relate the stories of his success in silencing all such people with much satisfaction and amusement".

- a) Who is being referred to in these lines?
- |                      |                   |
|----------------------|-------------------|
| i) V. S Naipaul      | ii) Lewis Carroll |
| iii) Rudyard Kipling | iv) Joseph Stalin |
- b) What was 'his horror' mentioned in these lines?
- |   |                            |
|---|----------------------------|
| i) Arrival of his acquaintance at his place | ii) gathering of autograph |
| iii) Being interviewed                      | iv) None of these          |
- c) What did the person being horrified repel?
- |                        |                      |
|------------------------|----------------------|
| i) Acquaintance        | ii) Interviewer      |
| iii) Autograph seekers | iv) All of the above |
- d) What does Lionise mean?
- e) Name the lesson and its author.
- f) Give an antonym of 'repel'.

**OR**

A girl from the countryside, she hadn't gone through all the stages of wordly experience that generally precede a position of importance and sophistication that she had found herself catapulted in to. She never quite recovered from the terror. She felt that day. That was the end of a brief and brilliant acting career- the legal adviser, who was also a member of the story department, had unwittingly brought about that sad end. While every other member of the department wore a kind of uniform-khadi dhoti with a slightly oversized and clumsily tailored white khadi shirt- the legal adviser wore pants and a tie and sometimes a coat that looked like a coat of mail. Often, he looked alone and helpless.

- a) Select the option that complete, the given sentence appropriately:  
'Stages of wordly experience' in the given context would refer to\_\_\_\_\_.
- |  |   |
|--|---|
| i) good education to gain knowledge            | ii) situation that require one to be street smart |
| iii) smaller, not so important roles in acting | iv) training in soft skills.                      |
- b) Select the suitable word from the extract to compete the following analogy:  
sealed : closed : : propelled : \_\_\_\_\_.
- c) Select the correct option fill in the blank.  
The harm done to the actress was a /an \_\_\_\_\_.
- |                      |                           |
|----------------------|---------------------------|
| i) well planned act  | ii) unintentional act     |
| iii) act of jealousy | iv) act of male dominance |
- d) Based on the above extract, choose the statement that is true for the legal adviser.
- |  |
|--|
| i) He disliked the actress from the countryside        |
| ii) He acted after thinking through things carefully   |
| iii) He did not get well with others in the department |
| iv) He was always dressed smartly                      |
- e) Identify the phrase that allows the reader to infer that the writer is sympathetic towards the professional fate of the actor.
- f) Complete the sentence with an appropriate explanation as per the extract.  
The writer uses the word 'uniform' to refer to the outfits of the departments members because juse like a uniform\_\_\_\_\_.

7.3 **Attempt any one of the two extracts given.**

4

You think... ..here's a boy?

You look at me..... and that's you see my face and

You think. That's bad. That's a terrible thing. That's  
the ugliest thing I ever saw. 'You think', poor boy.

But I'm not. Not poor. Underneath, you are afraid.

Anybody would be. I am. Whenever I look in the  
Mirror and see it. I am afraid of me.

a) Who is speaking here to whom?

i) Derry to Lamb

ii) Derry to his mother

iii) Derry to neighbouring woman

iv) None of the above

b) What is the 'terrible thing' referred to here?

i) Entering into Lamb garden

ii) Being afraid of Derry

iii) Derry's burnt face

iv) None of the above

c) Why does the speaker say 'you are afraid'?

d) How does the man being addressed react?

**OR**

But the utter pallor of the man's unconscious face moved him first to stoop and feel his pulse. It was faint but it was there. He put his hand against the man's cold breast. The heart too was yet alive.

"He will die unless he is operated on" Sadao said, considering".

"The question is whether he will not die anyway."

a) What did Sadao do to make sure if the man was alive?

i) He checked the man's pulse

ii) He checked the man's heart

iii) He checked the man's pulse and heart

iv) He checked the man's eyes

b) Sadao wants that the man:

i) should not die

ii) should dip

iii) should not cry

iv) should not eat food very early.

c) Explain the phrase 'the utter pallor'

d) Name the chapter and its author.

8. **Answer any five of the following in 40-50 words each.**

10

a) A teacher should be a friend, a philosopher and a guide for his students. Do you think M. Hamel fits into this image of a teacher? Discuss

b) State the common issue faced by most of the aged in the current times, with reference to the poem My Mother at Sixty Six.

c) The bangle makers of Firozabad make beautiful bangles and makes everyone happy but they live and die in squalor. Elaborate.

d) Give two reasons why according to Pablo Neruda, is 'Keeping Quiet' essential in attaining a better, more peaceful world.

e) Though still quite young Edla Willmansson had a good psychological insight and a keen observation. Comment.

f) Why do you think Aunt Jennifer created animals that are so different from her own character? What might the poet be suggesting through this difference?

9. **Answer any two of the following in 40-50 words each.**

4

a) Sam's letter to Charley is a fine blend of reality and fantasy. Comment.

b) What consideration influenced the Tiger King to get married?

c) Describe briefly the walk on the ocean by the member of the expedition 'students on Ice.'

10. **Answer any one of the following in about 120-150 words.**

5

'Champaran episode' was a turning point not only in Gandhiji's life, but also in the history of Indian freedom struggle. Don't you agree that Gandhiji's practically proven ideals of truth, non-violence and empathy for the deprived are still relevant? Write your ideas on 'Relevance of Gandhian ideals in today's world', in form of a paragraph.

**OR**

‘Going places is all about living one’s dreams and without realising that it is first a dream, living a dream as if it’ were a reality. ‘Viewing life through rose tinted glasses is also a dream. Comment.

11. **Answer any one of the following in about 120-150 words.**

5

On returning home, Tishani Doshi writes her thoughts reflecting on how her decision to enroll for the students on Ice programme has been the single most important decision of her life that has completely transformed her.

Imagine yourself to be Tishani Doshi and express these thoughts.

**OR**

Power leads to dominance and reaches oppression and ends up in rebellion and failure. How is this statement true in the case of the rebellion raised by Zitkala-Sa and Bama?

WOS

**SHRI GURU HARKRISHAN PUBLIC SCHOOL**

**SESSION:2022-23**

**ASSIGNMENT**

**CLASS-XII**

**SUBJECT-PHYSICS (042)**

**TIME ALLOWED:03 HOURS**

**MAXIMUM MARKS:70**

**General Instructions:**

1. There are 35 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
3. Section A contains eighteen MCQ of one mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study based questions of four marks each.
4. There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.
5. Use of calculators is not allowed.
6. This question paper contains 8 pages only.

**SECTION-A**

1. Two-point charge  $Q$  and  $-2Q$  are placed at some distance apart. If the electric field at the location of  $Q$  is  $E$ , then the electric field at the location of  $-2Q$  will be  
(i)  $-E/2$  (ii)  $-E$  (iii)  $-3E/2$  (iv)  $-2E$  1
2. The electric potential due to a small electric dipole at a large distance  $r$  from the centre of the dipole is proportional to  
(i)  $r$  (ii)  $1/r$  (iii)  $1/r^2$  (iv)  $1/r^3$  1
3. If a current of 300 mA is flowing in a conductor, then the number of electrons passed through the conductor in 4 min. is (Charge on an electron =  $1.6 \times 10^{-19}$  C)  
(i)  $4.5 \times 10^{20}$  (ii)  $4.5 \times 10^{18}$  (iii)  $9.0 \times 10^{20}$  (iv)  $9.0 \times 10^{18}$  1
4. Two thin, long, parallel wires, separated by a distance  $d$  carry a current of  $(i)A$  in the same direction. They will  
(a) attract each other with a force of  $\mu_0 i^2 / 2\pi d$  (b) repel each other with a force of  $\mu_0 i^2 / 2\pi d$   
(c) attract each other with a force of  $\mu_0 i^2 / 2\pi d^2$  (d) repel each other with a force of  $\mu_0 i^2 / 2\pi d^2$  1
5. Electron of mass  $m$  and charge  $q$  is travelling with a speed  $v$  along a circular path of radius  $r$  at right angles to a uniform magnetic field of intensity  $B$ . If the speed of the electron is doubled and the magnetic field is halved the resulting path would have a radius  
(a)  $2r$  (b)  $4r$  (c)  $r/4$  (d)  $r/2$  1

6. If a diamagnetic material is placed in a magnetic field, the magnetic field inside the material compared to that outside will be:

- (a) slightly less (b) slightly more (c) very high (d) same 1

7. An ac voltage source of variable angular frequency  $\omega$  and fixed amplitude  $V_0$  is connected in series with a capacitance  $C$  and an electric bulb of resistance  $R$  (inductance zero). When  $\omega$  is increased,

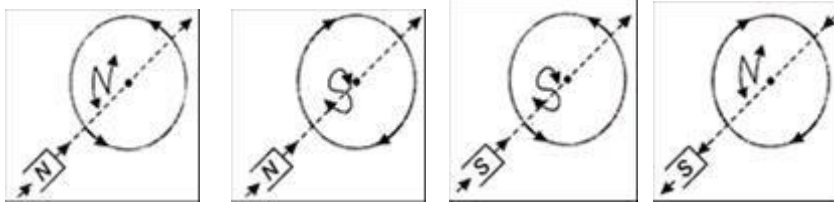
- (a) the bulb glows dimmer (b) the bulb glows brighter  
(c) impedance of the circuit increases (d) impedance remains unchanged 1

8. Out of the following options which one can be used produce a propagating electromagnetic wave?

- (a) A charge moving at constant velocity (b) A stationary charge  
(c) A chargeless particle (d) An accelerating charge 1

9. Which of the following figures correctly depicts the Lenz's law? The arrows show the movement of the labelled pole of a bar magnet into a closed circular loop and the arrows on the circle show the direction of the induced current

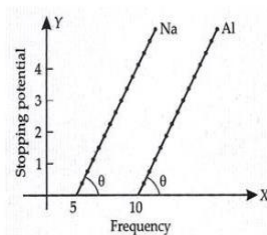
- (a) (b) (c) (d) 1



10. In a Young's double-slit experiment, the path difference, at a certain point on the screen between two interfering waves is  $(1/8)$ th of wavelength. The ratio of the intensity at this point to that at the centre of a bright fringe is close to

- (a) 0.80 (b) 0.74 (c) 0.94 (d) 0.85 1

11. From the given figure describing photoelectric effect we may infer correctly that



- (a) Na and Al both have the same threshold frequency  
(b) maximum kinetic energy for both the metals depends linearly on the frequency  
(c) the change in stopping potentials are different for Na and Al for the same change in frequency  
(d) Al is a better photosensitive material than Na 1

12. Energy  $E$  of a hydrogen atom with principle quantum number  $n$  is given by  $E = -\frac{13.6}{n^2} eV$ . The energy of a photon ejected when the electron jumps from  $n=3$  to  $n=2$  state of hydrogen is approximately  
(a) 1.5eV (b) 0.85eV (c) 3.4eV (d) 1.9eV 1

13. Which of the following is incorrect about nuclear force?  
(a) The nuclear force between two nucleons falls rapidly to zero as their distance is more than a few femtometres.  
(b) The nuclear force is much weaker than the Coulomb force.  
(c) The force is attractive for distances larger than 0.8 fm and repulsive if they are separated by distances less than 0.8 fm.  
(d) The nuclear force between neutron-neutron, proton-neutron and proton-proton is approximately the same. 1

14. To obtain electrons as majority charge carriers in a semiconductors the impurity mixed is:  
(a) monovalent (b) divalent (c) trivalent (d) pentavalent 1

15. A charge particle is placed between the plates of a charged parallel plate capacitor. It experiences a force  $F$ . If one of the plates is removed, the force on the charge particle becomes  
(A)  $F$  (B)  $2F$  (C)  $\frac{F}{2}$  (D) Zero 1

16. Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A  
b) Both A and R are true and R is NOT the correct explanation of A  
c) A is true but R is false  
d) A is false and R is also false 1

ASSERTION(A): The electrical conductivity of a semiconductor increases on doping.  
REASON: Doping always increases the number of electrons in the semiconductor.

17. Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A  
b) Both A and R are true and R is NOT the correct explanation of A  
c) A is true but R is false  
d) A is false and R is also false 1

ASSERTION: Diffraction is common in sound but not common in light waves.  
REASON: Diffraction effect is more pronounced if the size of obstacle or aperture is of the order of the wavelength of the waves.

18. Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A  
b) Both A and R are true and R is NOT the correct explanation of A  
c) A is true but R is false  
d) A is false and R is also false

1

**ASSERTION :** The kinetic energy of photoelectrons emitted from metal surface does not depend on the intensity of incident photon.

**REASON :** The ejection of electrons from metallic surface is not possible with frequency of incident photons below the threshold frequency.

### Section-B

- 19.(a) What are the directions of electric and magnetic field vectors relative to each other and relative to the direction of propagation of electromagnetic waves? (b) Name the electromagnetic waves which  
(i) maintain the earth's warmth and  
(ii) are used in aircraft navigation.

2

20. The susceptibility of a magnetic material is  $-2.6 \times 10^{-5}$ . Identify the type of magnetic material and state its two properties.

2

- 21.(a) Two nuclei have mass numbers in the ratio 1: 2. What is the ratio of their nuclear densities?  
(b) Two nuclei have mass numbers in the ratio 1: 8. What is the ratio of their nuclear radii?

2

**OR**

Calculate the shortest wavelength in the Balmer series of hydrogen atom. In which region of hydrogen spectrum does this wavelength lie?

22. The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. If focal length of the lens is 12 cm, find the refractive index of the material of the lens.

2

23. (a) Explain, how a depletion region is formed in a junction diode? (b) What happens to the width of depletion layer of a p-n junction when it is (i)forward biased?  
(ii)reverse biased?

2

**OR**

Draw energy band diagram of n-type and p-type semiconductor at temperature  $T > 0K$ . Mark the donor and acceptor energy level with their energies.

- 24.(a) How does the angular separation between fringes in single-slit diffraction experiment change when the distance of separation between the slit and screen is doubled?  
(b) How does the fringe width, in Young's double-slit experiment, change when the distance of separation between the slits and screen is doubled?

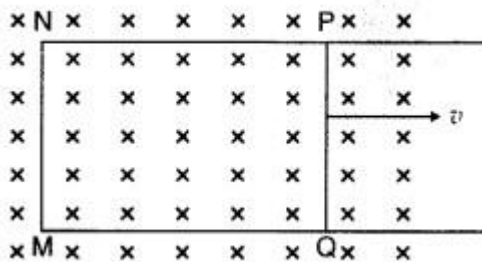
2



25. Two-point charges,  $q_1 = 10 \times 10^{-8}\text{C}$ ,  $q_2 = -2 \times 10^{-8}\text{C}$  are separated by a distance of 60 cm in air. Find at what distance from the 1<sup>st</sup> charge,  $q_1$  would the electric potential be zero. 2

### SECTION-C

26. A rectangular coil of sides 'a' and 'b' carrying a current I is subjected to a uniform magnetic field B acting perpendicular to its plane. Obtain the expression for the torque acting on it. 3
27. A rectangular loop PQMN with movable arm PQ of length 10 cm and resistance  $2 \Omega$  is placed in a uniform magnetic field of 0.1 T acting perpendicular to the plane of the loop as is shown in the figure. The resistances of the arms MN, NP and MQ are negligible. Calculate the  
 (i) emf induced in the arm PQ and  
 (ii) current induced in the loop when arm PQ is moved with velocity 20 m/s.



3

28. A series LCR circuit is connected to an ac source. Using the phasor diagram, derive the expression for the impedance of the circuit. Plot a graph to show the variation of current with frequency of the source, explaining the nature of its variation. 3

OR

- (a) When an a.c. source is connected to an ideal capacitor show that the average power supplied by the source over a complete cycle is zero.
- (b) A lamp is connected in series with a capacitor. Predict your observations when the system is connected first across a d.c. and then an a.c. source. What happens in each case if the capacitance of the capacitor is reduced?

29. Draw the graph showing the variation of photo electric current with anode potential of a photocell for

- (i) the same frequencies but different intensities  $I_3 > I_2 > I_1$  of incident radiation.  
 (ii) the same intensity but different frequencies  $\nu_1 > \nu_2 > \nu_3$  of incident radiation.

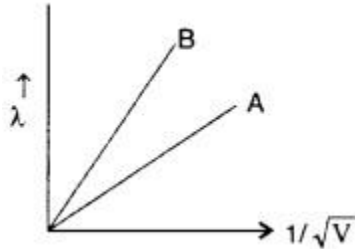
- (iii) Write Einstein's photoelectric equation.

3

OR

- (a) An electron and alpha particle have the same de-Broglie wavelength associated with them. How are their kinetic energies related to each other?

(b) Two lines, A and B, in the plot given below show the variation of de-Broglie wavelength,  $\lambda$  versus  $1/\sqrt{V}$  Where  $V$  is the accelerating potential difference, for two particles carrying the same charge. Which one of two represents a particle of smaller mass ? 3



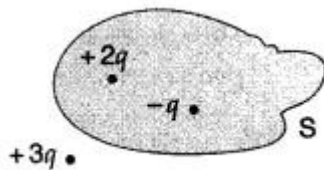
30. The work function of the following metals is given :

Na = 2.75 eV, K = 2.3 eV, Mo = 4.17 eV and Ni 5.15 eV.

Which of these metals will not cause photoelectric emission for radiation of wavelength 3300 Å from a laser source placed 1 m away from these metals? What happens if the laser source is brought nearer and placed 50 cm away? 3

#### Section-D

31. (i) Figure shows three point charges,  $+2q$ ,  $-q$  and  $+3q$ . Two charges  $+2q$  and  $-q$  are enclosed within a surface 'S'. What is the electric flux due to this configuration through the surface 'S'?



(ii) Given a uniform electric field  $\vec{E} = 4 \times 10^3 \hat{i}$  N/C. Find the flux of this field through a square of 5 cm on a side whose plane is parallel to the Y-Z plane. What would be the flux through the same square if the plane makes a  $30^\circ$  angle with the x-axis? 5

OR

(i) A thin conducting spherical shell of radius  $R$  has charge  $Q$  spread uniformly over its surface. Using Gauss's law, derive an expression for an electric field at a point outside the shell. Draw a graph of electric field  $E(r)$  with distance  $r$  from the centre of the shell for  $0 \leq r \leq \infty$

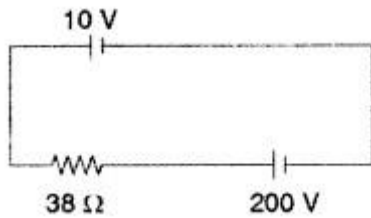
(ii) Two charges of magnitudes  $-3Q$  and  $+2Q$  are located at points  $(a, 0)$  and  $(4a, 0)$  respectively. What is the electric flux due to these charges through a sphere of radius  $'5a'$  with its centre at the origin?

32.(i) Two wires of equal length, one of copper and the other of manganin have the same resistance. Which wire is thicker?

(ii) A battery of emf  $6\text{ V}$  and internal resistance  $2\Omega$  is connected to a resistor. If the current in the circuit is  $0.25\text{ A}$ , find

(a) the resistance of the resistors; (b) the terminal voltage of the battery.

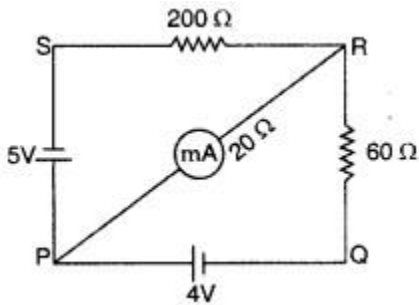
(iii) A  $10\text{ v}$  battery of negligible internal resistance is connected across a  $200\text{ V}$  battery and a resistance of  $38\Omega$  as shown in the figure. Find the value of the current in circuit.



5

OR

(i)The network PQRS, shown in the circuit diagram, has the batteries of  $4\text{ V}$  and  $5\text{ V}$  and negligible internal resistance. A milliammeter of  $20\Omega$  resistance is connected between P and R. Calculate the reading in the milliammeter.



(ii) Explain the term 'drift velocity' of electrons in a conductor. Hence obtain the expression for the current through a conductor in terms of 'drift velocity'

33.a (i) Define a wavefront. How is it different from ray?

ii) What is the geometrical shape of the wavefront of light diverging from a point?

b)fig shows a ray of light falling normally on the face AB of an equilateral glass prism having refractive index  $3/2$ ,placed in water of refractive index  $4/3$ .Will this ray suffer total internal reflection on striking the face AC?Justify your answer.

5

OR

a)Write two points of difference between an interference pattern and a diffraction pattern.

b) A point source of monochromatic light 'S' is kept at the centre of the bottom of a cylinder of radius 15.0cm.The cylinder contains water(refractive index  $4/3$ ) to a height of 7cm.Draw the ray diagram and calculate the area of water surface through which the light emerges in air.

34. Case Study :

Read the following paragraph and answer the questions. A number of optical devices and instruments have been designed and developed such as periscope, binoculars, microscopes and telescopes utilising the reflecting and refracting properties of mirrors, lenses and prisms. Most of them are in common use. Our knowledge about the formation of images by the mirrors and lenses is the basic requirement for understanding the working of these devices.

(i) Why the image formed at infinity is often considered most suitable for viewing. 1

Explain (ii) In modern microscopes multicomponent lenses are used for both the objective and the eyepiece. Why? 1

(iii) Write two points of difference between a compound microscope and an astronomical telescope 2

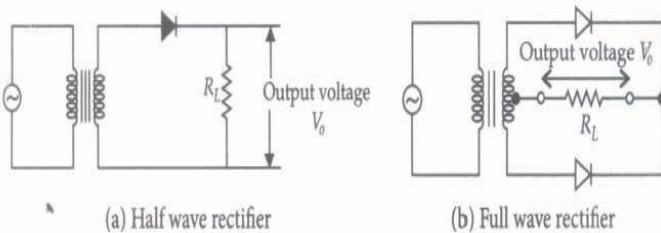
OR

Write two distinct advantages of a reflecting type telescope over a refracting type telescope.

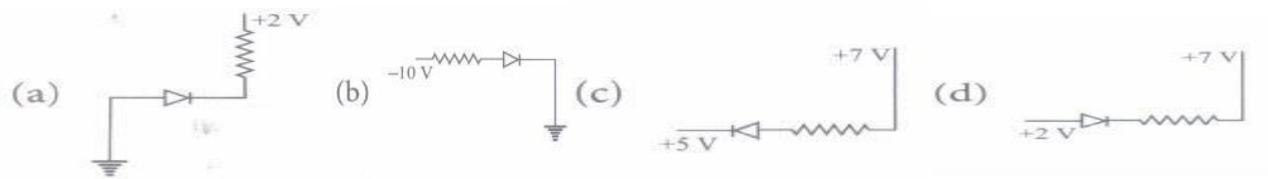
35. Case Study

When the diode is forward biased, it is found that beyond forward voltage  $V = V_B$ , called barrier voltage, the conductivity is very high. At this value of battery biasing for p-n junction, the potential barrier is overcome and the current increases rapidly with increase in forward voltage. When the diode is reverse biased, the reverse bias voltage produces a very small current about a few microamperes which almost remains constant with bias. This small current is reverse saturation current.

Rectifier is a device which is used for converting alternating current or voltage into direct current or voltage. Its working is based on the fact that the resistance of p-n junction becomes low when forward biased and becomes high when reverse biased. A half-wave rectifier uses only a single diode while a full wave rectifier uses two diodes as shown in figures (a) and (b) .



(i) In which of the following figures, the p-n diode is forward biased.



- (ii) Draw the input and output waveform for half wave rectifier and full wave rectifier. 1
- (iii) Name the process involved in the formation of pn junction diode. 1
- 2

OR

Draw the V-I characteristic curve for pn junction diode.

**Sri Guru Harkrishan Public School**

**Subject:- Physics**

**Class :- XII**

**MM: 70**

**General Instruction.**

**i) There are 35 questions in all .The question paper has five sections: Section A, Section B, Section C Section D and Section E. All the sections are compulsory**

**ii)(Section A contains eighteen MCQs of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks rack, section D contains three long questions of five marks each and Section E contains two case study based questions of marks each**

**SECTION A**

- 1.The resistance of a metal wire increases with increasing temperature a)decrease in free electron density.(b) decrease in relaxation time.c) increase in mean free path.d) increase in the mass of electron.**
- 2. ratio of current density and electric field is called. a) Resistivity b) Conductivity c) Drift velocity d) Mobility**
- 3.The sensitivity of a moving coil galvanometer increases with the decrease in: (a) number of turns b)area of coil c)magnetic field d) torsional rigidity.**
- 4. A voltmeter of range 2V and resistance 300 N cannot be converted to an ammeter of range:  
(a) 5 mA b)8mA. c)1A. d) 10A**
- 5. One requires 11 eV of energy to dissociate a carbon monoxide molecule into carbon and oxygen atoms. The minimum frequency of the appropriate electromagnetic radiation to achievw the dissociation lies in a)visible region b) infrared region c) ultraviolet region d) microwave region**
- 6. Out of the following options which one can be used to produce a propagating electromagnetic wave?  
a) chargeless particle b) An accelerating charge c) charge with constant velocity d) A stationary charge.**
- 7. Whenever the flux linked with a circuit changes, there is an induced emf in the circuit. This emf in the circuit lasts a) for a very short duration b) for a long duration c) forever d) as long as the magnetic flux in the circuit changes.**
- 8. The area of a square shaped coil is  
 $10^{-2}\text{m}^2$ . Its plane is perpendicular to a magnetic field of strength  $10^{-3}\text{ T}$ . The magnetic flux linked with the coil is  
a) 10 Wb b)  $10^{-5}\text{ Wb}$ . c) $10^5\text{ wb}$ . d)100wb**

9. In an ac circuit maximum value of voltage is 423 volt its effective voltage is  
 a) 400 V. B) 300V. c) 323V. d) 340V
10. The average power dissipation in pure inductance is  
 a)  $\frac{1}{2} LI^2$ . B)  $\frac{1}{4} LI^2$ . C)  $2LI^2$ . D) 0
11. The number of photoelectrons emitted for lighter frequency  $\nu$  higher than the threshold frequency  $\nu_0$  is proportional to  
 a) Threshold frequency b) intensity of light c) frequency of light d)  $\nu - \nu_0$
12. Two particles A1 and A2 of masses  $m_1$  and  $m_2$ ,  $m_1$  is greater than  $m_2$  have the same De Broglie wavelength then  
 a) Their momenta are same b) energies are same c) energy of A1 is less than energy of A2  
 d) energy of A1 is more than energy of A2
13. The ratio of speed of the electron in the ground state of hydrogen to the speed of light in vacuum is  
 a)  $\frac{1}{2}$  b)  $\frac{2}{237}$ . C)  $\frac{1}{137}$ . D)  $\frac{1}{237}$
14. In the following transition of the hydrogen atom the one which gives an absorption line of the highest frequency is a)  $n = 1$  to  $2$ . B)  $n = 3$  to  $8$ . C)  $n = 2$  to  $1$ . D)  $n = 8$  to  $3$
15. The energy nuclear reactor is obtained due to  
 a) Nuclear fission. B) nuclear fusion.  
 C) photoelectric effect. D) radioactive decay
16. The atomic nucleus contains  
 a) protons and electrons. B) neutrons and electrons. C) electrons. D) Proton and neutrons
17. Which of the following statement is not true for nuclear force  
 a) Attractive. B) charge independent. C) short range. D) decreases very quickly
18. The size of the atom is proportional to  
 a)  $A$  b)  $A^{1/3}$  c)  $A^{2/3}$  d)  $A^{-1/3}$

### SECTION B

19. A square coil of side 10 cm consists of 20 turns and carries a current of 12 A. The coil is suspended vertically and normal to the plane of the coil makes an angle of  $30^\circ$  with the direction of uniform horizontal magnetic field of magnitude 0.80 T. What is the magnitude of the torque experienced by the coil?

- 20.** Define the term self-inductance of a solenoid. Obtain the expression for the magnetic stored in an inductor of self-inductance  $L$  to build up a current  $I$  through it.
- 21.** Define power factor .State the conditions under which it is maximum and minimum.
- 22.** State two properties of electromagnetic waves.
- 23.** A proton and an electron have same velocity which one has greater de broglie wavelength and why ?
- 24.** State Bohr's quantization condition for defining stationary orbit.
- 25.** Two nuclei have mass number in that ratio 1:8. What is the ratio of their nuclear radii .

### SECTION C

- 26.** State faradays laws of electromagnetic induction.
- 27.** (a) is impedance?  
 (b) A series LCR circuit is connected to an ac source having voltage  $V = V_0 \sin \omega t$ . Derive expression for the impedance, instantaneous current and its phase relationship to the applied voltage.
- 28.** a) How does oscillating charge produce electromagnetic waves?  
 b) Sketch a schematic diagram depicting oscillating electric and magnetic fields of an em wave propagating along +z direction.
- 29.** What is the momentum ,speed and de Broglie wavelength of an electron with K.E of 120 eV?
- 30.** Obtain the binding energy of a nitrogen nucleus (N) from the following data in Mev.  
 $M(H) = 1.00783 \text{ u}$   $M(n) = 1.00867 \text{ u}$   
 $M(N) = 14.00307 \text{ u}$

### SECTION D

- 31.** Derive condition of balance of a Wheatstone bridge.

**OR**

With the help of a circuit, show how a moving coil galvanometer can be converted into an ammeter of a given range. Write the necessary mathematical formula.

- 32.** a) Define mutual inductance and write its SI units.  
 b) Derive an expression for the mutual inductance of two long co-axial length wound one over the other.

**OR**

State the working of AC generator with the help of labelled diagram.

- 33.a)** Derive the expression for the total energy of the electron in hydrogen atom. What is the significance of total negative energy possessed by the electron?



b) Draw the graph showing the variation of binding energy per nucleon with the mass number for a large number of nuclei  $2 < A < 240$  what are the main inferences from the graph?

**OR**

Describe an experimental arrangement to study photoelectric effect. Explain the effect of intensity of light, potential on photoelectric current and frequency of incident radiation on stopping potential.

### **SECTION E**

The large-scale transmission and distribution of electrical energy over long distances is done with the use of transformers. The voltage output of the generator is stepped-up. It is then transmitted over long distances to an area sub-station near the consumers. There the voltage is stepped down. It is further stepped down at distributing sub-stations and utility poles before a power supply of 240 V reaches our homes.

1. Which of the following statement is true? a) Energy is created when a transformer steps up the voltage. b) A transformer is designed to convert an AC voltage to DC voltage. c) Step-up transformer increases the power for transmission. d) Step-down transformer decreases the AC voltage.

2. If the secondary coil has a greater number of turns than the primary,

a) the voltage is stepped-up ( $V_2 > V_1$ ) and arrangement is called a step-up transformer

b) the voltage is stepped-down ( $V_2 < V_1$ ) and arrangement is called a step-down transformer

c) the current is stepped-up ( $I_2 > I_1$ ) and arrangement is called a step-up transformer

d) the current is stepped-down ( $I_2 < I_1$ ) and arrangement is called a transformer

3. We need to step-up the voltage for power transmission, so that

a) the current is reduced and consequently, the  $I^2R$  loss is cut down

b) the voltage is increased, the power losses are also increased c) the power is increased before transmission is done

d) the voltage is decreased so  $V^2/R$  losses are reduced

4. A power transmission line feeds input power at 2300 V to a step down transformer with its primary windings having 4000 turns. The number of turns in the secondary in order to get output power at 230 V are

a) 4 b) 40 c) 400. d) 4000

35. An electric charge (electron, ions) will experience a force if an electric field is applied. If we consider solid conductors, then of course the atoms are tightly bound to each other so that the current is carried by the negative charged electrons. Consider the first case when no electric

field is present, the electrons will be moving due to thermal motion during which they collide with the fixed ions. An electron colliding with an ion emerges with same speed as before the collision. However, the direction of its velocity after the collision is completely random. At a given time, there is no preferential direction for the velocities of the electrons. Thus, on an average, the number of electrons travelling in any direction will be equal to the number of electrons travelling in the opposite direction. So, there will be no net electric current. If an electric field is applied, the electrons will be accelerated due to this field towards positive charge. The electrons, as long as they are moving, will constitute an electric current. The free electrons in a conductor have random velocity and move in random directions. When current is applied across the conductor, the randomly moving electrons are subjected to electrical forces along the direction of electric field. Due to this electric field, free electrons still have their random moving nature, but they will move through the conductor with a certain force. The net velocity in a conductor due to the moving of electrons is referred to as the drift of electrons.

**1)** Define the term drift velocity of charge carriers in a conductor. Write its relationship with current flowing through it.

**2)** A steady current flows in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor: current, current density, drift speed?

**3)** A potential difference  $V$  is applied across the ends of copper wire of length  $l$  and diameter  $D$ . What is the effect on drift velocity of electrons if (i)  $V$  is halved (ii) is doubled **OR**  
Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires.

CHEMISTRY

**Time : 3 hrs.**

**M. Marks : 70**

**General Instructions**

- (a) All questions are compulsory.
- (b) Section A: Q.no. 1 to 20 are very short answer questions (objective type) and carry 1 mark each.
- (c) Section B: Q.no. 21 to 27 are short answer questions and carry 2 marks each.
- (d) Section C: Q.no. 28 to 34 are long answer questions and carry 3 marks each.
- (e) Section D: Q.no. 35 to 37 are also long answer questions and carry 5 marks each.
- (f) There is no overall choice. However an internal choice has been provided in two questions of two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
- (g) Use log tables if necessary, use of calculators is not allowed.

**SECTION - A**

Read the given passage and answer the questions 1 to 5 that follow:

A Lead storage battery is the most important type of secondary cell having a lead anode and a grid of lead packed with  $\text{PbO}_2$  as cathode. A 38% solution of sulphuric acid is used as electrolyte. (Density =  $1.294 \text{ g mL}^{-1}$ ) The battery holds 3.5 L of the acid. During the discharge of the battery, the density of  $\text{H}_2\text{SO}_4$  falls to  $1.139 \text{ g mL}^{-1}$ . (20%  $\text{H}_2\text{SO}_4$  by mass)

- (1) Write the reaction taking place at the cathode when the battery is in use.
- (2) How much electricity in terms of Faraday is required to carry out the reduction of one mole of  $\text{PbO}_2$ ?
- (3) What is the molarity of sulphuric acid before discharge?
- (4) Lead storage battery is considered a secondary cell. Why?
- (5) Write the products of electrolysis when dilute sulphuric acid is electrolysed using Platinum electrodes.

Questions 6 to 10 are one word answers:

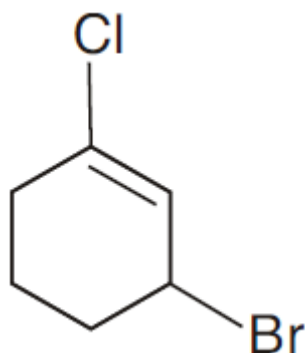
- (6) Name the substance used as depressant in the separation of two sulphide ores in Froth floatation method.
- (7) Name the unit formed by the attachment of a base to 1' position of sugar in a nucleoside.
- (8) Name the species formed when an aqueous solution of amino acid is dissolved in water?
- (9) What type of reaction occurs in the formation of Nylon 6,6 polymer?

(10) Which of the following compounds would undergo Cannizzaro reaction:

Benzaldehyde, Cyclohexanone, 2-Methylpentanal.

Questions 11 to 15 are multiple choice questions:

(11) The IUPAC name of the compound shown below is:



- (a) 2-bromo-6-chlorocyclohex-1-ene
- (b) 6-bromo-2-chlorocyclohexene
- (c) 3-bromo-1-chlorocyclohexene
- (d) 1-bromo-3-chlorocyclohexene

(12) When one mole of  $\text{CoCl}_3 \cdot 5\text{NH}_3$  was treated with excess of silver nitrate solution, 2 mol of  $\text{AgCl}$  was precipitated. The formula of the compound is:

- (a)  $[\text{Co}(\text{NH}_3)_5\text{Cl}_2]\text{Cl}$
- (b)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
- (c)  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2](\text{NH}_3)\text{Cl}$
- (d)  $[\text{Co}(\text{NH}_3)_3\text{Cl}_3](\text{NH}_3)_2$

(13) The absorption maxima of several octahedral complex ions are as follows:

S.No	Compound	$\lambda_{\text{max}}$ nm
1	$[\text{Co}(\text{NH}_3)_6]^{3+}$	475
2	$[\text{Co}(\text{CN})_6]^{3-}$	310
3	$[\text{Co}(\text{H}_2\text{O})_6]^{3+}$	490

The crystal field splitting is maximum for :

- (a)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (b)  $[\text{Co}(\text{CN})_6]^{3-}$
- (c)  $[\text{Co}(\text{NH}_3)_6]^{3+}$

- (d) All the complex ions have the same splitting,  $\Delta_o$ ,
- (14) Predict the number of ions produced per formula unit in an aqueous solution of  $[\text{Co}(\text{en})_3]\text{Cl}_3$
- (a) 4  
 (b) 3  
 (c) 6  
 (d) 2
- (15) The incorrect statement about LDP is:
- (a) It is obtained through the free radical addition of ethene.  
 (b) It consists of linear molecules.  
 (c) It is obtained by the H-atom abstraction.  
 (d) Peroxide is used as an initiator.

Questions 16 to 20 :

- (A) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.  
 (B) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.  
 (C) Assertion is correct, but reason is wrong statement.  
 (D) Assertion is wrong, but reason is correct statement.

**16. Assertion:** The two strands in double strand helix structure of DNA are complementary to each other

**Reason:** Disulphide bonds are formed between specific pairs of bases

**17. Assertion:** Glucose reacts with hydroxylamine to form an oxime and also adds a molecule of hydrogen cyanide to give cyanohydrin.

**Reason:** The carbonyl group is present in the open chain structure of glucose.

**18. Assertion:** The acidic strength of halogen acids varies in the order  $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$

**Reason:** The bond dissociation enthalpy of halogen acids decreases in the order

19. **Assertion:**  $\text{C}_2\text{H}_5\text{OH}$  is a weaker base than phenol but is a stronger nucleophile than phenol. (1)

**Reason: In phenol the lone pair of electrons on oxygen is withdrawn towards the ring due to resonance.**

20. **Assertion: Aryl halides undergo nucleophilic substitution reactions with ease.**

**Reason: The carbon halogen bond in aryl halides has partial double bond character.**

### SECTION : B

21. Calculate the number of lone pairs on central atom in the following molecule and predict the geometry.

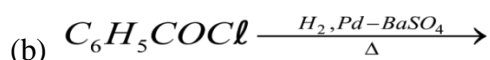
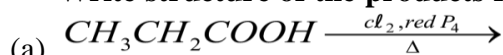


22. The rate of a reaction depends upon the temperature and is quantitatively expressed as

$$k = A e^{-E_a/RT}$$

- i) If a graph is plotted between  $\log k$  and  $1/T$ , write the expression for the slope of the reaction?
- ii) If at under different conditions  $E_{a1}$  and  $E_{a2}$  are the activation energy of two reactions. If  $E_{a1} = 40 \text{ J/mol}$  and  $E_{a2} = 80 \text{ J/mol}$ . Which of the two has a larger value of the rate constant?
23. The experimentally determined molar mass for what type of substances is always lower than the true value when water is used as solvent. Explain. Give one example of such a substance and one example of a substance which does not show a large variation from the true value.

24. **Write structure of the products formed:**



25. Draw one of the geometrical isomers of the complex  $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$  which is optically inactive. Also write the name of this entity according to the IUPAC nomenclature.

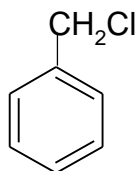
OR

Discuss the bonding in the coordination entity  $[\text{Co}(\text{NH}_3)_6]^{3+}$  on the basis of valence bond theory. Also, comment on the geometry and spin of the given entity. (Atomic no. of Co = 27)

26. What is meant by Vapour phase refining? Write any one example of the process which illustrates this technique, giving the chemical equations involved.

OR

- Write and explain the reactions involved in the extraction of gold.
27. Which one of the following compounds will undergo hydrolysis at a faster rate by  $S_N1$  mechanism? Justify.



or  $CH_3CH_2CH_2Cl$

**SECTION: C**

28. Calculate the freezing point of a solution containing 0.5 g KCl (Molar mass = 74.5 g/mol) dissolved in 100 g water, assuming KCl to be 92% ionized.  
 $K_f$  of water = 1.86 K kg / mol.
29. For the reaction  $A + B \rightarrow$  products, the following initial rates were obtained at various given initial concentrations

S.No.	[A] mol / L	[B] mol / L	Initial rate M/s
1.	0.1	0.1	0.05
2.	0.2	0.1	0.10
3.	0.1	0.2	0.05

Determine the half-life period.

OR

A first order reaction is 50 % complete in 50 minutes at 300 K and the same reaction is again 50 % complete in 25 minutes at 350 K. Calculate activation energy of the reaction.

30. Answer the following questions:
- (a) Which of the following electrolytes is most effective for the coagulation of  $AgI/Ag^+$  sol?  
 a.  $MgCl_2$ ,  $K_2SO_4$ ,  $K_4[Fe(CN)_6]$
- (b) What happens when a freshly precipitated  $Fe(OH)_3$  is shaken with a little amount of dilute solution of  $FeCl_3$ .
- (c) Out of sulphur sol and proteins, which one forms macromolecular colloids?
31. Account for the following:
- a) Moist  $SO_2$  decolourises  $KMnO_4$  solution.

- b) In general interhalogen compounds are more reactive than halogens (except fluorine).
- c) Ozone acts as a powerful oxidizing agent
32. Identify the product formed when propan-1-ol is treated with Conc.  $\text{H}_2\text{SO}_4$  at 413 K . Write the mechanism involved for the above reaction.
33. (a) Give chemical tests to distinguish between the following pairs of compounds:
- (i) Ethanal and Propanone.
- (ii) Pentan-2-one and Pentan-3-one.
- (b) Arrange the following compounds in increasing order of their acid strength: Benzoic acid, 4- Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4- Methoxybenzoic acid.

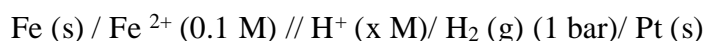
OR

Compare the reactivity of benzaldehyde and ethanal towards nucleophilic addition reactions. Write the cross aldol condensation product between benzaldehyde and ethanal.

34. Define and write an example for the following :
- (a) Broad spectrum antibiotics.
- (b) Analgesics

### SECTION: D

35. (a) The e.m.f. of the following cell at 298 K is 0.1745 V



$$\text{Given : } E_{\text{Fe}^{2+}/\text{Fe}}^0 = -0.44\text{V}$$

Calculate the  $\text{H}^+$  ions concentration of the solution at the electrode where hydrogen is being produced.

- (b) Aqueous solution of copper sulphate and silver nitrate are electrolysed by 1 ampere current for 10 minutes in separate electrolytic cells. Will the mass of copper and silver deposited on the cathode be same or different? Explain your answer.

OR



- (a) Calculate the degree of dissociation of 0.0024 M acetic acid if conductivity of this solution is  $8.0 \times 10^{-5} \text{ S cm}^{-1}$ .

$$\text{Given } \lambda_{H^+}^{\circ} = 349.6 \text{ S cm}^2 \text{ mol}^{-1}; \lambda_{CH_3COO^-}^{\circ} = 40.9 \text{ S cm}^2 \text{ mol}^{-1}$$

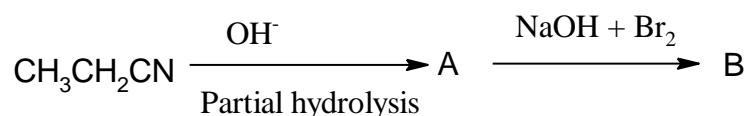
- (b) Solutions of two electrolytes 'A' and 'B' are diluted. The limiting molar conductivity of 'B' increases to a smaller extent while that of 'A' increases to a much larger extent comparatively. Which of the two is a strong electrolyte? Justify your answer.
36. An organic compound A' with molecular formula  $C_7H_7NO$  reacts with  $Br_2/aqKOH$  to give compound B', which upon reaction with  $NaNO_2 \& HCl$  at  $0^{\circ}C$  gives C'. Compound C' on heating with  $CH_3CH_2OH$  gives a hydrocarbon D'. Compound B' on further reaction with  $Br_2$  water gives white precipitate of compound E'. Identify the compound A, B, C, D&E; also justify your answer by giving relevant chemical equations.

OR

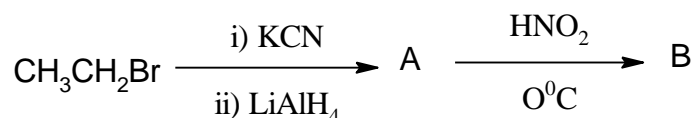
- (a) How will you convert:
- Aniline into Fluorobenzene.
  - Benzamide into Benzylamine.
  - Ethanamine to N,N-Diethylethanamine.

- (b) Write the structures of A and B in the following:

i)



ii)



37. (a) When a chromite ore (A) is fused with an aqueous solution of sodium carbonate in free excess of air, a yellow solution of compound (B) is obtained. This solution is filtered and acidified with sulphuric acid to form compound (C). Compound (C) on treatment with solution of KCl gives orange crystals of compound (D). Write the chemical formulae of compounds A to D.
- (b) Describe the cause of the following variations with respect to lanthanoids and actinoids:
- Greater range of oxidation states of actinoids as compared to lanthanoids.

- (ii) Greater actinoid contraction as compared to lanthanoid contraction.
- (iii) Lower ionisation enthalpy of early actinoids as compared to the early lanthanoids.

**OR**

(a) What happens when

- (i) Manganate ions ( $MnO_4^{2-}$ ) undergoes disproportionation reaction in acidic medium?
- (ii) Lanthanum is heated with Sulphur?

(b) Explain the following trends in the properties of the members of the First series of transition elements:

- (i)  $E^\circ(M^{2+}/M)$  value for copper is positive(+0.34 V) in contrast to the other members of the series.
- (ii)  $Cr^{2+}$  is reducing while  $Mn^{3+}$  is oxidising, though both have  $d^4$  configuration.
- (iii) The oxidising power in the series increases in the order  $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$ .

# SAMPLE PAPER (2022-23)

## CHEMISTRY THEORY

(043)

MM:70

Time: 3 hours

### General Instructions:

Read the following instructions carefully.

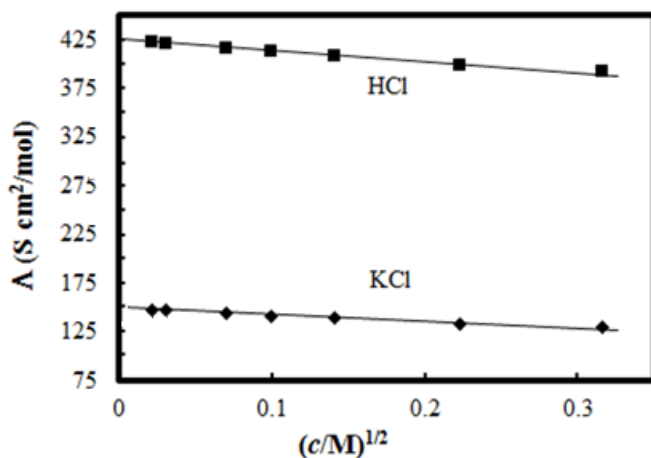
- There are **35** questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case- based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.**
- Use of log tables and calculators is not allowed**

### SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

- The major product of acid catalysed dehydration of 1-methylcyclohexanol is:
  - 1-methylcyclohexane
  - 1-methylcyclohexene
  - 1-cyclohexylmethanol
  - 1-methylenecyclohexane
- Which one of the following compounds is more reactive towards  $S_N1$  reaction?
  - $CH_2=CHCH_2Br$
  - $C_6H_5CH_2Br$
  - $C_6H_5CH(C_6H_5)Br$
  - $C_6H_5CH(CH_3)Br$
- $KMnO_4$  is coloured due to:
  - d-d transitions
  - charge transfer from ligand to metal
  - unpaired electrons in d orbital of Mn
  - charge transfer from metal to ligand

4. Which radioactive isotope would have the longer half-life  $^{15}\text{O}$  or  $^{19}\text{O}$ ? (Given rate constants for  $^{15}\text{O}$  and  $^{19}\text{O}$  are  $5.63 \times 10^{-3} \text{ s}^{-1}$  and  $k = 2.38 \times 10^{-2} \text{ s}^{-1}$  respectively.)
- $^{15}\text{O}$
  - $^{19}\text{O}$
  - Both will have the same half-life
  - None of the above, information given is insufficient
5. The molar conductivity of  $\text{CH}_3\text{COOH}$  at infinite dilution is  $390 \text{ Scm}^2/\text{mol}$ . Using the graph and given information, the molar conductivity of  $\text{CH}_3\text{COOK}$  will be:



- $100 \text{ Scm}^2/\text{mol}$
- $115 \text{ Scm}^2/\text{mol}$
- $150 \text{ Scm}^2/\text{mol}$
- $125 \text{ Scm}^2/\text{mol}$

**\*FOR VISUALLY CHALLENGED LEARNERS**

- \*5. What is the molar conductance at infinite dilution for sodium chloride if the molar conductance at infinite dilution of  $\text{Na}^+$  and  $\text{Cl}^-$  ions are  $51.12 \times 10^{-4} \text{ Scm}^2/\text{mol}$  and  $73.54 \times 10^{-4} \text{ Scm}^2/\text{mol}$  respectively?
- $124.66 \text{ Scm}^2/\text{mol}$
  - $22.42 \text{ Scm}^2/\text{mol}$
  - $198.20 \text{ Scm}^2/\text{mol}$
  - $175.78 \text{ Scm}^2/\text{mol}$

6. For the reaction,  $A + 2B \rightarrow AB_2$ , the order w.r.t. reactant A is 2 and w.r.t. reactant B. What will be change in rate of reaction if the concentration of A is doubled and B is halved?

- a. increases four times
- b. decreases four times
- c. increases two times
- d. no change

7. Arrange the following in the increasing order of their boiling points:

A : Butanamine, B: N,N-Dimethylethanamine, C: N- Ethylethanaminamine

- a.  $C < B < A$
- b.  $A < B < C$
- c.  $A < C < B$
- d.  $B < C < A$

8. The CFSE of  $[\text{CoCl}_6]^{3-}$  is  $18000 \text{ cm}^{-1}$  the CFSE for  $[\text{CoCl}_4]^-$  will be:

- a.  $18000 \text{ cm}^{-1}$
- b.  $8000 \text{ cm}^{-1}$
- c.  $2000 \text{ cm}^{-1}$
- d.  $16000 \text{ cm}^{-1}$

9. What would be the major product of the following reaction?



- a.  $\text{A} = \text{C}_6\text{H}_5\text{CH}_2\text{OH}$ ,  $\text{B} = \text{C}_6\text{H}_6$
- b.  $\text{A} = \text{C}_6\text{H}_5\text{CH}_2\text{OH}$ ,  $\text{B} = \text{C}_6\text{H}_5\text{Br}$
- c.  $\text{A} = \text{C}_6\text{H}_5\text{CH}_3$ ,  $\text{B} = \text{C}_6\text{H}_5\text{Br}$
- d.  $\text{A} = \text{C}_6\text{H}_5\text{CH}_2\text{Br}$ ,  $\text{B} = \text{C}_6\text{H}_5\text{OH}$

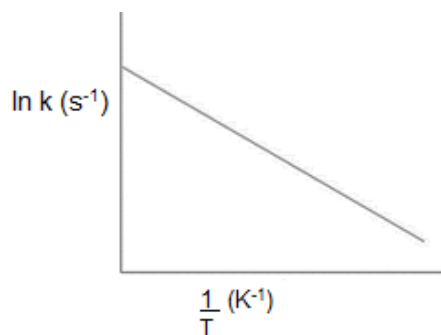
10. Which of the following statements is not correct for amines?

- a. Most alkyl amines are more basic than ammonia solution.
- b.  $\text{p}K_b$  value of ethylamine is lower than benzylamine.
- c.  $\text{CH}_3\text{NH}_2$  on reaction with nitrous acid releases  $\text{NO}_2$  gas.
- d. Hinsberg's reagent reacts with secondary amines to form sulphonamides.

11. Which of the following tests/ reactions is given by aldehydes as well as ketones?

- a. Fehling's test
- b. Tollen's test
- c. 2,4 DNP test
- d. Cannizzaro reaction

12. Arrhenius equation can be represented graphically as follows:

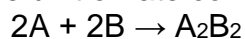


The (i) intercept and (ii) slope of the graph are:

- a. (i)  $\ln A$  (ii)  $E_a/R$
- b. (i)  $A$  (ii)  $E_a$
- c. (i)  $\ln A$  (ii)  $-E_a/R$
- d. (i)  $A$  (ii)  $-E_a$

**\*FOR VISUALLY CHALLENGED LEARNERS**

\*12. The unit of rate constant for the reaction



which has rate =  $k [A]^2[B]$  is:

- a.  $\text{mol L}^{-1}\text{s}^{-1}$
- b.  $\text{s}^{-1}$
- c.  $\text{mol L}^{-1}$
- d.  $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$

13. The number of ions formed on dissolving one molecule of  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  in water is:

- a. 3
- b. 4
- c. 5
- d. 6

14. The oxidation of toluene to benzaldehyde by chromyl chloride is called

- a. Etard reaction
- b. Riemer-Tiemann reaction
- c. Stephen's reaction
- d. Cannizzaro's reaction

15. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion (A):** An ether is more volatile than an alcohol of comparable molecular mass.

**Reason (R):** Ethers are polar in nature.

Select the most appropriate answer from the options given below:

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion (A):** Proteins are found to have two different types of secondary structures viz alpha-helix and beta-pleated sheet structure.

**Reason (R):** The secondary structure of proteins is stabilized by hydrogen bonding.

Select the most appropriate answer from the options given below:

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion :** Magnetic moment values of actinides are lesser than the theoretically predicted values.

**Reason :** Actinide elements are strongly paramagnetic.

Select the most appropriate answer from the options given below:

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion (A):** Tertiary amines are more basic than corresponding secondary and primary amines in gaseous state.

**Reason (R):** Tertiary amines have three alkyl groups which cause +I effect.

Select the most appropriate answer from the options given below:

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

## SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. A first-order reaction takes 69.3 min for 50% completion. What is the time needed for 80% of the reaction to get completed?

(Given:  $\log 5 = 0.6990$ ,  $\log 8 = 0.9030$ ,  $\log 2 = 0.3010$ )

20. Account for the following:

- There are 5 OH groups in glucose
- Glucose is a reducing sugar

**OR**

What happens when D – glucose is treated with the following reagents

- Bromine water
- $\text{HNO}_3$

21. Give reason for the following:

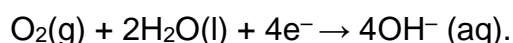
- During the electrophilic substitution reaction of haloarenes, para substituted derivative is the major product.
- The product formed during  $\text{S}_{\text{N}}1$  reaction is a racemic mixture.

**OR**

- Name the suitable alcohol and reagent, from which 2-Chloro-2-methyl propane can be prepared.
- Out of the Chloromethane and Fluoromethane, which one has higher dipole moment and why?

22. The formula  $\text{Co}(\text{NH}_3)_5\text{CO}_3\text{Cl}$  could represent a carbonate or a chloride. Write the structures and names of possible isomers.

23. Corrosion is an electrochemical phenomenon. The oxygen in moist air reacts as follows:



Write down the possible reactions for corrosion of zinc occurring at anode, cathode, and overall reaction to form a white layer of zinc hydroxide.

24. Explain how and why will the rate of reaction for a given reaction be affected when

- a catalyst is added
- the temperature at which the reaction was taking place is decreased

25. Write the reaction and IUPAC name of the product formed when 2-Methylpropanal (isobutyraldehyde) is treated with ethyl magnesium bromide followed by hydrolysis.



## SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. Write the equations for the following reaction:

- Salicylic acid is treated with acetic anhydride in the presence of conc.  $\text{H}_2\text{SO}_4$
- Tert butyl chloride is treated with sodium ethoxide.
- Phenol is treated with chloroform in the presence of NaOH

27. Using Valence bond theory, explain the following in relation to the paramagnetic complex  $[\text{Mn}(\text{CN})_6]^{3-}$

- type of hybridization
- magnetic moment value
- type of complex – inner, outer orbital complex

28. Answer the following questions:

- State Henry's law and explain why are the tanks used by scuba divers filled with air diluted with helium (11.7% helium, 56.2% nitrogen and 32.1% oxygen)?
- Assume that argon exerts a partial pressure of 6 bar. Calculate the solubility of argon gas in water. (Given Henry's law constant for argon dissolved in water,  $K_H = 40\text{kbar}$ )

29. Give reasons for **any 3** of the following observations:

- Aniline is acetylated before nitration reaction.
- $\text{p}K_b$  of aniline is lower than the m-nitroaniline.
- Primary amine on treatment with benzenesulphonyl chloride forms a product which is soluble in NaOH however secondary amine gives product which is insoluble in NaOH.
- Aniline does not react with methyl chloride in the presence of anhydrous  $\text{AlCl}_3$  catalyst.

- 30.
- Identify the major product formed when 2-cyclohexylchloroethane undergoes a dehydrohalogenation reaction. Name the reagent which is used to carry out the reaction.
  - Why are haloalkanes more reactive towards nucleophilic substitution reactions than haloarenes and vinylic halides?

OR

- Name the possible alkenes which will yield 1-chloro-1-methylcyclohexane on their reaction with HCl. Write the reactions involved.
- Allyl chloride is hydrolysed more readily than n-propyl chloride. Why?

## SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

### 31. **Strengthening the Foundation: Chargaff Formulates His "Rules"**

Many people believe that James Watson and Francis Crick discovered DNA in the 1950s. In reality, this is not the case. Rather, DNA was first identified in the late 1860s by Swiss chemist Friedrich Miescher. Then, in the decades following Miescher's discovery, other scientists--notably, Phoebus Levene and Erwin Chargaff--carried out a series of research efforts that revealed additional details about the DNA molecule, including its primary chemical components and the ways in which they joined with one another. Without the scientific foundation provided by these pioneers, Watson and Crick may never have reached their groundbreaking conclusion of 1953: that the DNA molecule exists in the form of a three-dimensional double helix.

Chargaff, an Austrian biochemist, as his first step in this DNA research, set out to see whether there were any differences in DNA among different species. After developing a new paper chromatography method for separating and identifying small amounts of organic material, Chargaff reached two major conclusions:

- (i) the nucleotide composition of DNA varies among species.
- (ii) Almost all DNA, no matter what organism or tissue type it comes from maintains certain properties, even as its composition varies. In particular, the amount of adenine (A) is similar to the amount of thymine (T), and the amount of guanine (G) approximates the amount of cytosine (C). In other words, the total amount of purines (A + G) and the total amount of pyrimidines (C + T) are usually nearly equal. This conclusion is now known as "Chargaff's rule."

Chargaff's rule is not obeyed in some viruses. These either have single- stranded DNA or RNA as their genetic material.

#### **Answer the following questions:**

- a. A segment of DNA has 100 adenine and 150 cytosine bases. What is the total number of nucleotides present in this segment of DNA?
- b. A sample of hair and blood was found at two sites. Scientists claim that the samples belong to same species. How did the scientists arrive at this conclusion?
- c. The sample of a virus was tested and it was found to contain 20% adenine, 20% thymine, 20 % guanine and the rest cytosine. Is the genetic material of this virus (a) DNA- double helix (b) DNA-single helix (c) RNA? What do you infer from this data?

OR

How can Chargaff's rule be used to infer that the genetic material of an organism is double- helix or single- helix?

32. Henna is investigating the melting point of different salt solutions. She makes a salt solution using 10 mL of water with a known mass of NaCl salt. She puts the salt solution into a freezer and leaves it to freeze. She takes the frozen salt solution out of the freezer and measures the temperature when the frozen salt solution melts. She repeats each experiment.

S.No	Mass of the salt used in g	Melting point in °C	
		Readings Set 1	Reading Set 2
1	0.3	-1.9	-1.9
2	0.4	-2.5	-2.6
3	0.5	-3.0	-5.5
4	0.6	-3.8	-3.8
5	0.8	-5.1	-5.0
6	1.0	-6.4	-6.3

**Assuming the melting point of pure water as 0°C, answer the following questions:**

- One temperature in the second set of results does not fit the pattern. Which temperature is that? Justify your answer.
- Why did Henna collect two sets of results?
- In place of NaCl, if Henna had used glucose, what would have been the melting point of the solution with 0.6 g glucose in it?

OR

What is the predicted melting point if 1.2 g of salt is added to 10 mL of water? Justify your answer.

### SECTION E

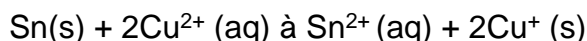
The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. a. Why does the cell voltage of a mercury cell remain constant during its

- lifetime?
- Write the reaction occurring at anode and cathode and the products of electrolysis of aq KCl.
  - What is the pH of HCl solution when the hydrogen gas electrode shows a potential of -0.59 V at standard temperature and pressure?

**OR**

- Molar conductivity of substance "A" is  $5.9 \times 10^3$  S/m and "B" is  $1 \times 10^{-16}$  S/m. Which of the two is most likely to be copper metal and why?
- What is the quantity of electricity in Coulombs required to produce 4.8 g of Mg from molten  $\text{MgCl}_2$ ? How much Ca will be produced if the same amount of electricity was passed through molten  $\text{CaCl}_2$ ? (Atomic mass of Mg = 24 u, atomic mass of Ca = 40 u).
- What is the standard free energy change for the following reaction at room temperature? Is the reaction spontaneous?



34. A hydrocarbon (A) with molecular formula  $\text{C}_5\text{H}_{10}$  on ozonolysis gives two products (B) and (C). Both (B) and (C) give a yellow precipitate when heated with iodine in presence of NaOH while only (B) give a silver mirror on reaction with Tollen's reagent.
- Identify (A), (B) and (C).
  - Write the reaction of B with Tollen's reagent
  - Write the equation for iodoform test for C
  - Write down the equation for aldol condensation reaction of B and C.

**OR**

An organic compound (A) with molecular formula  $\text{C}_2\text{Cl}_3\text{O}_2\text{H}$  is obtained when (B) reacts with Red P and  $\text{Cl}_2$ . The organic compound (B) can be obtained on the reaction of methyl magnesium chloride with dry ice followed by acid hydrolysis.

- Identify A and B
  - Write down the reaction for the formation of A from B. What is this reaction called?
  - Give any one method by which organic compound B can be prepared from its corresponding acid chloride.
  - Which will be the more acidic compound (A) or (B)? Why?
  - Write down the reaction to prepare methane from the compound (B).
35. Answer the following:
- Why are all copper halides known except that copper iodide?
  - Why is the  $E^\circ_{(\text{V}^{3+}/\text{V}^{2+})}$  value for vanadium comparatively low?
  - Why HCl should not be used for potassium permanganate titrations?

- d. Explain the observation, at the end of each period, there is a slight increase in the atomic radius of d block elements.
- e. What is the effect of pH on dichromate ion solution?

PRE-FINALS - 1 DECEMBER EXAMS

TIME- 3Hours

CLASS-12

SUB—BIOLOGY

M.M-70

1.. In eukaryotes RNA polymerase-1 transcribe.

- (a) tRNA, 5SrRNA and SnRNAS (b) hnRNA  
(c) both (a) and (b) (d) rRNAs (28s, 18s and 5.8s)

2. The bones of forelimbs of whale, bat, cheetah and man are similar in structure, because :

- (a) one organism has given rise to another (b) they share a common ancestor  
(c) they perform the same function (d) they have biochemical similarities..

3.AIDS is caused by HIV. Among the following, which one is not a mode of transmission of HIV?

- a. Transfusion of contaminated blood b. Sharing of infected needles  
.c. Shaking hands with infected person d. Sexual contact with infected person

4.Sickle cell anemia is a/an \_\_\_\_\_

- a. diseaseX linked b. Autosomal dominant c, Autosomal recessive d. Y linked

5. The sporozoites that cause infection when a female Anopheles mosquito bites a human being are formed in:

- (a) Liver of human (b) RBCs of mosquito  
(c) salivary glands of mosquito (d) intestine of human.

6. Which of the following is not a lymphoid tissue?

- (a) Spleen (c) Appendix (b) Tonsils (d) Thymus.

7. Which of the following has popularized the PCR (polymerase chain reactions)?

- (a) Easy availability of DNA template  
(b) Availability of synthetic primers  
(c) Availability of cheap deoxyribonucleotide  
(d) Availability of "Thermostable' DNA polymerase.

8.The sporozoites that causes infection when a female mosquito bites are formed in.

---

- (a)Liver of human (b) RBCs of mosquito (c) salivary glands of mosquito (d) intestine of human.

9.. The genes causing cancer are:

- (a) structural genes (b) expressor genes (d) regulatory genes. (c) oncog

10 Acrosome is a type of

- (a) lysosome (b) flagellum (c) ribosome (d) basal body

**11 A protoxin is:**

- (a) A primitive toxin    (b) A denatured toxin    (c) Toxin produced by protozoa    (d) Inactive toxin.

**12 Match the column I with column II.**

Column I	Column II
i) linked DNA	(a) Ti plasmid
II)TDNA	(b) Cohen and Boyer
III)First r DNA	(c) PBR 322
IV)E.coli cloning vecror	(d) Ligase

Codes.

- (a) (i) - (b), (ii) - (d), (iii) - (c), (iv) - (a)  
(b) (i) - (d), (ii) - (a), (iii) - (b), (iv) - (c)  
(c) (i) - (c), (ii) - (b), (iii) - (a), (iv) - (d)  
(d) (i) - (d), (ii) - (a), (iii) - (b), (iv) - (c)

**Assertion (A) and Reason (R).Answer these questions selecting the appropriate option given below:**

- A. Both A and R are true and R is the correct explanation of A**  
**B. Both A and R are true and R is not the correct explanation of A**  
**C. A is true but R is false**  
**D A is False but R is true**

**13. Assertion A:** Mature mammalian ovarian follicles called Graafian follicles.

**Reason R:** They are the source of the uterus secretion

**14. Assertion A .MRI is the best method to detect cancer.**

**Reason R:** it does not involve radiation

**15. Assertion A .ABO blood groups system in human beings is controlled by simple dominant gene.**

**Reason R:** Human beings have A.B.AB.O blood groups.

**16 . Assertion A:** Interferons are glycoproteins which are produced by virally infected cells.

**Reason:** Interferon stimulate inflammation at the site of injury.

## SECTION B

17. Why are menstrual cycles absent during pregnancy?

18. In a monohybrid cross of plants with red and white flowered plants, Mendel got only red flowered plants. On self-pollinating these F<sub>1</sub> plants got both red and white flowered plants in 3:1 ratio. Explain the basis of using RR and rr symbols to represent the genotype of plants of parental generation.

19. If a patient is advised Anti Retroviral Therapy, which infection is he suffering from? Name the causative organism

20. How the selection and isolation of DNA segments is done?

21. Karyotype of a child shows trisomy of chromosome number 21

Identify the disorder and state the symptoms which are likely to be exhibited in this case.

## SECTION C

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22 (a) What is Progesterone? What is its function?

(b) How do Leydig cells help in spermatogenesis?

(c) Differentiate between Graafian follicle and corpus luteum.

23 (a) .How would you find out the genotype of a pea plant with violet flowers? Explain with the help of Punnett's square showing crosses.

(b) Name a few enzymes involved in DNA replication other than DNA polymerase and ligase. Name the key functions for each of them.

24. (a) Among the five factors that are known to affect Hardy- Weinberg equilibrium, three factors are gene flow, genetic drift and genetic recombination. What are the other two factors?

b). name the causative agent of ring worm. Mention its symptoms.

---

25 Describe S.L. Miller's experiment. Comment on the observations he made and his contribution towards the origin of life on Earth.

26. (a) How and at what stage does Plasmodium enter into a human body?

(b) With the help of a flow chart only show the stages of asexual reproduction in the life-cycle of the parasite in the infected human.

(c) Why does the victim show symptoms of high fever?

27 What are the post transcriptional changes discuss in detail .

28 Name the technique used to amplify the DNA fragment .discuss its requirement and procedure also draw the diagrams.

---



## SECTION-D

**29.** Read the given paragraph and answer the following questions.

Mutation is a phenomenon which results in alternation of DNA sequences and consequently results in changes in the genotype and phenotype of an organism. Loss or gain of a segment of DNA result in alteration in chromosomes. Since, genes are located on the chromosomes, alteration in chromosomes results in abnormalities or aberrations. Chromosomal aberrations are commonly observed in cancer cells. There are many chemical and physical factors that cause mutations.

- (a) Phenotype of an organism is-----.
- (b) In addition to mutation, which is another phenomenon that leads to variation in DNA?
- (c) Mutation that arise due to change in a single base pair of DNA is known as.-----

Or

Give a classical example of point mutation.

**30.** Read the given paragraph and answer the following questions.

The overall ability of the host to fight the disease-causing organisms conferred by the immune system is called immunity. It is of two types. One type is non-specific type of defence which is accomplished by providing different types of barriers. The other type of immunity is pathogen specific. Immune responses in such a type of immunity are carried out with the help of two special types of lymphocytes. One of these lymphocytes produce proteins called antibodies. Which counteract the pathogens. When a host is exposed to antigens, antibodies are produced in its body. Preformed antibodies can also be administered to develop immunity in some cases. Sometimes the immune system shows exaggerated response to certain antigens. The substances to which such an immune response is produced are called allergens.

- (a) Differentiate between active and passive immunity.
- (b) What are Interferons?
- (c) Name the antibody found in colostrum.

Or

What are allergens?

## SECTION-E

**31.** Draw a neat diagram of the female reproductive system and label the parts associated with the following: (a) production of gamete, (b) site of fertilisation, (c) site of implantation and (d) birth canal.

OR

Write note on the following Epididymus, spermiation, cortical reaction, colostrum, placenta.

---

32. (a) What does lac operon consist of?

(b) How is the operator switch turned on and off in the expression of genes in this operon? Explain.

Or

Define bacterial transformation. Who demonstrated it experimentally and how?

33. (a) What is shown in the diagram? Label the parts A, B, C, D of the diagram

(b). Name the techniques used to introduce rDNA in plant and animal cells.

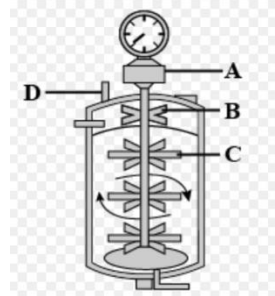
(c) What is a cry gene. How is it manipulated in the agricultural field?

Or

(a) Compare and contrast the advantages and disadvantages of production of genetically modified crops.

(b) What is a recombinant DNA vaccine? Give two examples.

(c) Give the full form of ELISA. Which disease can be detected using it? Discuss the principle underlying the test.



**Sample Question Paper**  
**Class XII (2019-20)**  
**Biology (044)**

**Time allowed: 3hrs.**

**Maximum Marks: 70**

**General Instructions:**

1. There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
2. Section A contains question numbers 1 to 5, multiple choice questions of one mark each.  
Section B contains question numbers 6 to 12, short answer type I questions of two marks each.  
Section C contains question numbers 13 to 21, short answer type II questions of three marks each.  
Section D contains question number 22 to 24, case-based short answer type questions of three marks each (1+1+1).  
Section E contains question numbers 25 to 27, long answer type questions of five marks each.
3. There is no overall choice in the question paper. However, internal choices are provided in two questions of one mark, one question of two marks, two questions of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.

**SECTION – A**

1. Androgens are synthesized by: 1
  - a.) Sertoli Cells
  - b.) Leydig cells
  - c.) Seminal vesicles
  - d.) Bulbourethral gland

**OR**

A procedure that finds use in testing for genetic disorders, but is also misused for foeticide is:

- a.) Lactational amenorrhea
  - b.) Amniocentesis
  - c.) Artificial insemination
  - d.) Parturition
- 
2. Transplantation of tissues/organs to save certain patients often fails due to rejection of such tissues/organs in the patient's body. Which type of immune response is responsible for such rejection? 1
    - a.) auto-immune response
    - b.) humoral immune response
    - c.) physiological immune response
    - d.) cell-mediated immune response

**OR**

Which of the following are the correct reasons for Rheumatoid arthritis?

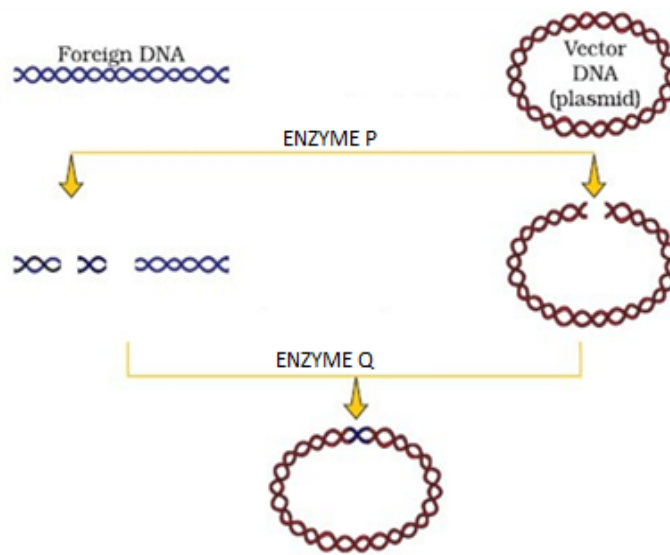
- i.) Lymphocytes become more active
- ii.) Body attacks self cells
- iii.) More antibodies are produced in the body
- iv.) The ability to differentiate pathogens or foreign molecules from self cells is lost

Choose the correct answer from the options given below:

- a.) i and ii
- b.) iii and iv
- c.) i and iii
- d.) ii and iv

3. Name the enzymes 'P' and 'Q' that carry out the following processes

1



- a.) Enzyme P-Exonuclease and Enzyme Q-Permease
- b.) Enzyme P-Exonuclease and Enzyme Q- Ligase
- c.) Enzyme P-Endonuclease and Enzyme Q- Permease
- d.) Enzyme P-Endonuclease and Enzyme Q-Ligase

4. A biotechnologist wanted to create a colony of *E.coli* possessing the plasmid pBR322, sensitive to Tetracycline. Which one of the following restriction sites would he use to ligate a foreign DNA?

1

- a.) Sal I
- b.) Pvu I
- c.) EcoRI
- d.) Hind III

5. Most important cause of biodiversity loss is:

1

- a.) Over exploitation of economic species
- b.) Habitat loss and fragmentation
- c.) Invasive species
- d.) Breakdown of plant-pollinator relationships

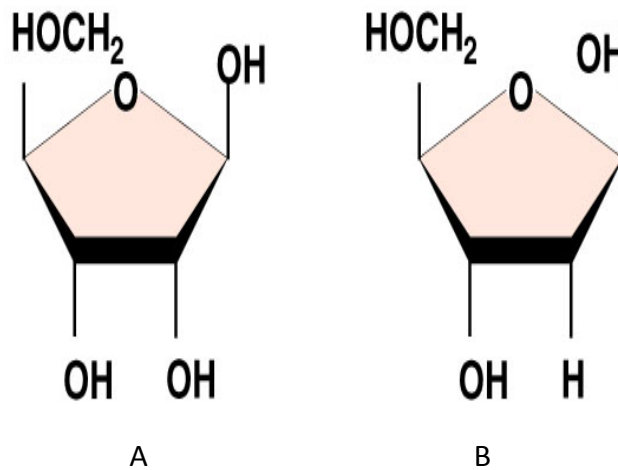
## SECTION B

6. How does an encysted *Amoeba* reproduce on return of favourable conditions? 2

**OR**

What are gemmules and conidia? Name one organism each in which these are formed?

7. Name any two copper related IUD's. Explain how it acts as a contraceptive? 2
8. Why is it not possible to study the inheritance pattern of traits in human beings, the same way as it is done in pea plant? Name the alternate method employed for such an analysis of human traits. 2
9. Carefully examine structures A and B of pentose sugar given below. Which one is more reactive? Give reasons. 2



10. Name the technology and the procedure involved which can help a scientist recover virus free sugarcane plants from diseased canes for his crop breeding experiments. 2
11. Explain the events that occur in the host cell on introduction of nematode-resistant gene into the tobacco plant by using *Agrobacterium* vectors. 2
12. Construct a pyramid of biomass starting with phytoplankton. Label three trophic levels. Is the pyramid upright or inverted? Justify your answer. 2

## SECTION C

13. Draw a well labelled diagram of L.S of a pistil showing the passage of growing of pollen tube up to its destination. 3
14. How does gain or loss of chromosome(s) takes place in humans? Describe one example each of chromosomal disorder along with the symptoms involving an autosome and a sex chromosome. 3

OR

A small stretch of DNA that codes for a polypeptide is given below

3'----- CAT CAT AGA TGA AAC----- 5'

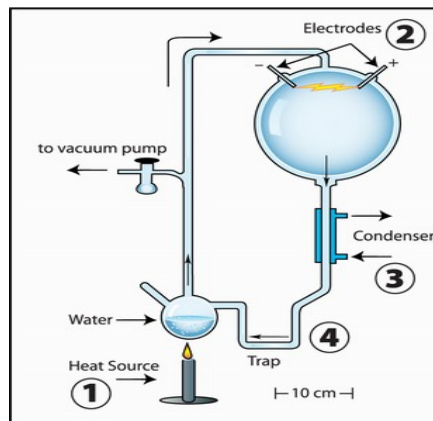
a.) Which type of mutation could have occurred in each type resulting in the following mistakes during replication of the above original sequence?

- i. 3`... .. ...CAT CAT AGA TGA ATC... .. 5`
- ii. 3`... .. ...CAT ATA GAT GAA AC... .. 5`

b.) How many amino acids will be translated in each of the above two cases?

15. "Apomixes is a form of asexual reproduction that mimics sexual reproduction in plants". Explain with the help of a suitable example. 3

16. 3



- a.) State the hypothesis which S.L. Miller tried to prove in the laboratory with the help of the set up given above.
- b.) Name the organic compound observed by him in the liquid water after running the above experiment.
- c.) A scientist simulated a similar set up and added CH<sub>4</sub>, NH<sub>3</sub> and water vapour at 800 °C. Which important component is missing in his experiment?

17. a.) 3

FILL IN THE BLANKS PROVIDED		
Amino acid	Phe	Val
DNA Code in Gene	AAA	CAC
Codon in mRNA	(i)	(ii)
Anticodon in tRNA	(iii)	(iv)

- b.) A polypeptide consists of 14 different amino acids.
  - i) How many base pairs must be there in the processed mRNA that codes for this polypeptide?
  - ii) How many different types of tRNA are needed for the synthesis of this polypeptide?

18. How can inbreeding be both advantageous and disadvantageous in cattle breeding programme? (Mention any **two** advantages and **two** disadvantages ) 3

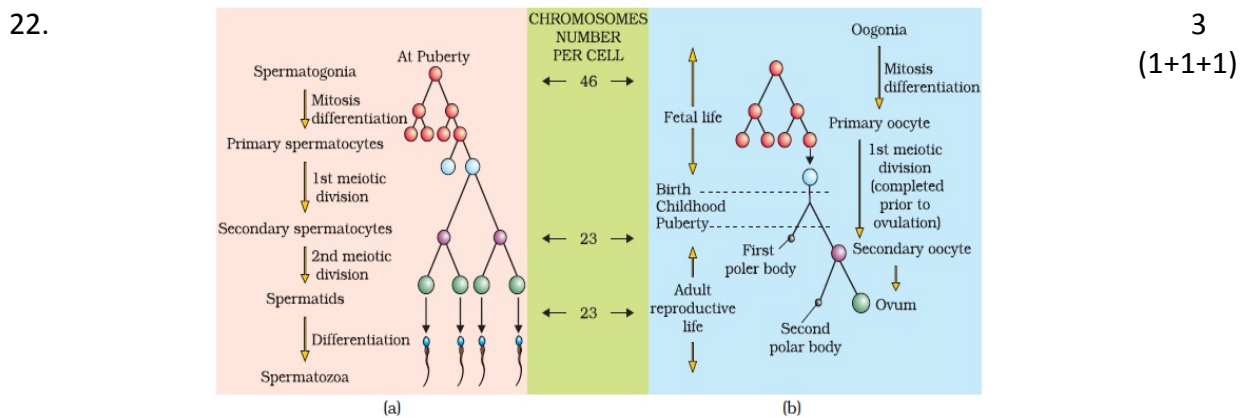
19. "Specific Bt Toxin gene is incorporated into cotton plant so as to control infestation of Bollworm". Mention the organism from which the gene was isolated and explain its mode of action. 3
20. State any two criteria for determining biodiversity hotspots. Name any two hotspots designated in India. 3

**OR**

Differentiate between in-situ and ex-situ approaches for conserving biodiversity. Give an example for each.

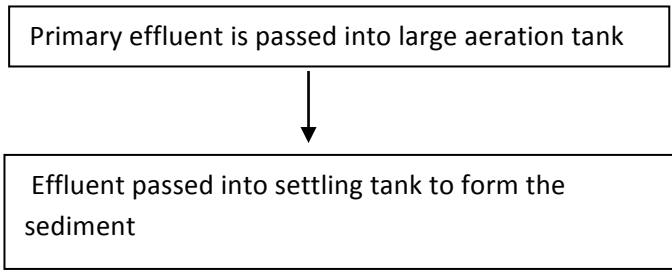
21. When the gene product is required in large amounts, so transformed bacteria with the plasmid inside the bacteria are cultured on a large scale in an industrial fermenter which then synthesizes its protein. This product is extracted from the fermenter for commercial use. 3
- a.) Why is the used medium drained out from one side while fresh medium is added from the other?
- b.) List any four optimum conditions for achieving the desired product in a bioreactor.

**SECTION D**



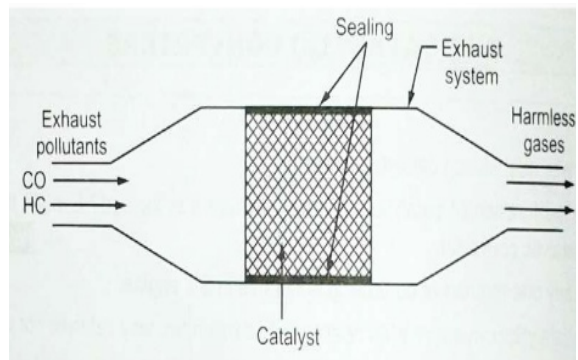
With reference to the above schematic diagram of Spermatogenesis (a) and Oogenesis(b), answer the following questions

- a.) About 300 million spermatozoa may be present in a human male ejaculation at one time. Calculate how many spermatocytes will be involved to produce this number of spermatozoa.
- b.) How many spermatids will be formed?
- c.) How many chromatids are found during Oogenesis in Primary oocyte and First polar body in a human female?
23. Large quantities of sewage is generated everyday in cities and towns, which is treated in Sewage Treatment Plants (STPs) to make it less polluting. Given below is the flow diagram of one of the stages of STP. Observe the given flow diagram and answer the questions accordingly. 3 (1+1+1)



- a.) Why primary effluent is passed into large aeration tanks?
- b.) What is the scientific term used for the sediment formed? Mention its significance.
- c.) Explain the final step resulting in the formation of biogas in the large tank before the treated effluent is released into water bodies.

24.



3  
(1+1+1)

Observe the diagram of the catalytic converter and answer the questions which follow.

- a.) Name any two metals used as catalyst in the catalytic converter.
- b.) Name the gases released after passing the exhaust hydrocarbons through the catalytic converter.
- c.) Which other poisonous gas is missing in the exhaust pollutant of an automobile in the above diagram?

**SECTION E**

25. Certain phenotypes in human population are spread over a gradient and reflect the contribution of more than two genes. What is the term used for the types of inheritance? Describe it with the help of an example in human population.

5

**OR**

Summarize the process by which the sequence of DNA bases in Human Genome Project was determined using the method developed by Frederick Sanger. Name a free living non-pathogenic nematode who's DNA has been sequenced.

26. a.) What is mutation breeding? Give an example of a crop and disease to which resistance was induced by mutation.

5



b.) Differentiate between pisci culture and aquaculture.

**OR**

- a.) If a patient is advised anti-retroviral drug, which infection is he suffering from? Name the causative organism.
- b.) How do vaccines prevent subsequent microbial infections?
- c.) How a cancerous cell differs from the normal cell?
- d.) Many microbial pathogens enter the gut of humans along with food. Name the physiological barrier that protects the body from such pathogens.

27. "Indiscriminate human activities have strengthened the greenhouse effect resulting in Global Warming." Give the relative contribution of various Green House Gases in the form of a pie chart and explain the fate of the energy of sunlight reaching the earth's surface contributing towards Global Warming.

5

**OR**

Given below is a table depicting population interactions between species A and species B.

Type of interaction	Species A	Species B
(a)	(-)	(+)
(b)	(+)	(-)

Name the two types of population interactions (a) and (b) depicted in the above table.

Justify giving three reason, how the type of interaction (b) is important in an ecological context.

XXXXXXXXXX

## Sample Question Paper 2022-23

### CLASS XII BIOLOGY (044)

Maximum Marks: 70

Time: 3 hours

#### General Instructions:

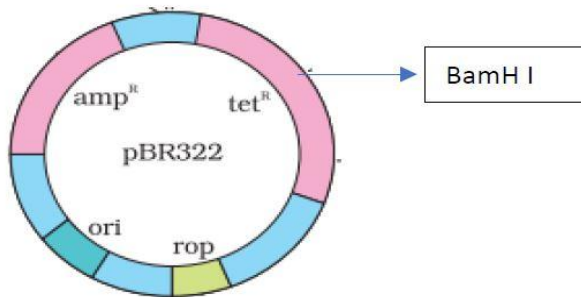
- (i) All questions are compulsory.
- (ii) The question paper has five sections and 33 questions. All questions are compulsory.
- (iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
- (iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- (v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION - A																						
Q.No.	Question	Marks																				
1.	<p>An infertile couple was advised to undergo In vitro fertilization by the doctor. Out of the options given below, select the correct stage for transfer to the fallopian tube for successful results?</p> <p>(a) Zygote only (b) Zygote or early embryo upto 8 blastomeres (c) Embryos with more than 8 blastomeres (d) Blastocyst Stage</p>	1																				
2.	<p>Given below are four contraceptive methods and their modes of action. Select the correct match:</p> <table border="1"><thead><tr><th>S. No.</th><th>Method</th><th>S. No</th><th>Mode of action</th></tr></thead><tbody><tr><td>a)</td><td>Condom</td><td>(i)</td><td>Ovum not able to reach Fallopian tube</td></tr><tr><td>b)</td><td>Vasectomy</td><td>(ii)</td><td>Prevents ovulation</td></tr><tr><td>c)</td><td>Pill</td><td>(iii)</td><td>Prevents sperm reaching the cervix</td></tr><tr><td>d)</td><td>Tubectomy</td><td>(iv)</td><td>Semen contains no sperms</td></tr></tbody></table> <p>(a) a)–(i)    b)–(ii)    c)– (iii)    d)–(iv) (b) a)–(ii)    b)–(iii)    c)–(iii)    d) – (i) (c) a)–(iii)    b)–(iv)    c)–(ii)    d)–(i) (d) a)–(iv)    b)–(i)    c)– (iii)    d)–(ii)</p>	S. No.	Method	S. No	Mode of action	a)	Condom	(i)	Ovum not able to reach Fallopian tube	b)	Vasectomy	(ii)	Prevents ovulation	c)	Pill	(iii)	Prevents sperm reaching the cervix	d)	Tubectomy	(iv)	Semen contains no sperms	1
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3	<p>Which of the following amino acid residues will constitute the histone core?</p> <p>(a) Lysine and Arginine  (b) Asparagine and Arginine  (c) Glutamine and Lysine  (d) Asparagine and Glutamine</p>	1															
4	<p>Evolutionary convergence is development of a</p> <p>(a) common set of functions in groups of different ancestry.  (b) dissimilar set of functions in closely related groups.  (c) common set of structures in closely related groups.  (d) dissimilar set of functions in unrelated groups.</p>	1															
5.	<p><i>Apis mellifera</i> are killer bees possessing toxic bee venom. Identify the treatment and the type of immunity developed from the given table to treat a person against the venom of this bee.</p> <table border="0"> <thead> <tr> <th></th> <th style="text-align: center;"><i>Remedy</i></th> <th style="text-align: center;"><i>Immunity</i></th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Inactivated proteins</td> <td>Active</td> </tr> <tr> <td>(b)</td> <td>Proteins of the venom</td> <td>Passive</td> </tr> <tr> <td>(c)</td> <td>Preformed antibodies</td> <td>Passive</td> </tr> <tr> <td>(d)</td> <td>Dead micro-organisms</td> <td>Active</td> </tr> </tbody> </table>		<i>Remedy</i>	<i>Immunity</i>	(a)	Inactivated proteins	Active	(b)	Proteins of the venom	Passive	(c)	Preformed antibodies	Passive	(d)	Dead micro-organisms	Active	1
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6.	<p>Interferons are most effective in making non-infected cells resistant against the spread of which of the following diseases in humans?</p> <p>(a) ascariasis  (b) ringworm  (c) amoebiasis  (d) AIDS</p>	1															
7.	<p>Which of the following water samples in the table given below, will have a higher concentration of organic matter?</p> <table border="1"> <thead> <tr> <th style="text-align: center;"><i>Water Sample</i></th> <th style="text-align: center;"><i>Level of pollution</i></th> <th style="text-align: center;"><i>Value of BOD</i></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">(a)</td> <td style="text-align: center;">High</td> <td style="text-align: center;">High</td> </tr> <tr> <td style="text-align: center;">(b)</td> <td style="text-align: center;">Low</td> <td style="text-align: center;">Low</td> </tr> <tr> <td style="text-align: center;">(c)</td> <td style="text-align: center;">Low</td> <td style="text-align: center;">High</td> </tr> <tr> <td style="text-align: center;">(d)</td> <td style="text-align: center;">High</td> <td style="text-align: center;">Low</td> </tr> </tbody> </table>	<i>Water Sample</i>	<i>Level of pollution</i>	<i>Value of BOD</i>	(a)	High	High	(b)	Low	Low	(c)	Low	High	(d)	High	Low	1
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(a)	High	High															
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(c)	Low	High															
(d)	High	Low															

8. The figure below shows the structure of a plasmid.

1



A foreign DNA was ligated at BamH1. The transformants were then grown in a medium containing antibiotics tetracycline and ampicillin. Choose the correct observation for the growth of bacterial colonies from the given table

	<i>Medium with Tetracycline</i>	<i>Medium with Ampicillin</i>
(a)	Growth	No growth
(b)	No growth	Growth
(c)	No growth	No Growth
(d)	Growth	Growth

9. Swathi was growing a bacterial colony in a culture flask under ideal laboratory conditions where the resources are replenished. Which of the following equations will represent the growth in this case?

1

(Where population size is  $N$ , birth rate is  $b$ , death rate is  $d$ , unit time period is  $t$ , and carrying capacity is  $K$ ).

- (a)  $dN/dt = KN$
- (b)  $dN/dt = r N$
- (c)  $dN/dt = r N(K-N/K)$
- (d)  $dN/dt = r N(K+N/K)$

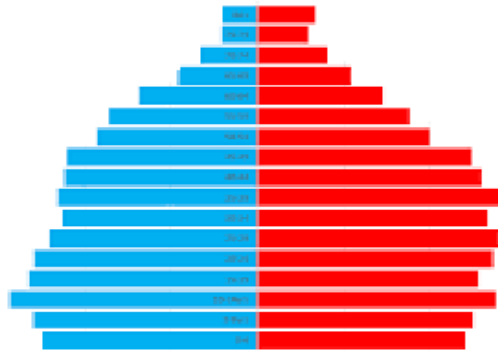
10. Sea Anemone gets attached to the surface of the hermit crab. The kind of population interaction exhibited in this case is

1

- (a) amensalism.
- (b) commensalism.
- (c) mutualism.
- (d) parasitism.

11.	<p>Which of the following food chains is the major conduit for energy flow in terrestrial and aquatic ecosystems respectively?</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 50%;"><i>Terrestrial Ecosystem</i></th> <th style="text-align: left; width: 50%;"><i>Aquatic Ecosystem</i></th> </tr> </thead> <tbody> <tr> <td>(a) Grazing</td> <td>Grazing</td> </tr> <tr> <td>(b) Detritus</td> <td>Detritus</td> </tr> <tr> <td>(c) Detritus</td> <td>Grazing</td> </tr> <tr> <td>(d) Grazing</td> <td>Detritus</td> </tr> </tbody> </table>	<i>Terrestrial Ecosystem</i>	<i>Aquatic Ecosystem</i>	(a) Grazing	Grazing	(b) Detritus	Detritus	(c) Detritus	Grazing	(d) Grazing	Detritus	1
<i>Terrestrial Ecosystem</i>	<i>Aquatic Ecosystem</i>											
(a) Grazing	Grazing											
(b) Detritus	Detritus											
(c) Detritus	Grazing											
(d) Grazing	Detritus											
12	<p>Which of the following is an example of ex situ conservation?</p> <p>(a) Sacred Groves  (b) National Park  (c) Biosphere Reserve  (d) Seed Bank</p>	1										
<p><b>Question No. 13 to 16 consist of two</b> statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:</p> <p>A. Both A and R are true and R is the correct explanation of A.  B. Both A and R are true and R is not the correct explanation of A.  C. A is true but R is false.  D. A is False but R is true.</p>												
13.	<p>Assertion: Apomictic embryos are genetically identical to the parent plant.  Reason: Apomixis is the production of seeds without fertilization.</p>	1										
14.	<p>Assertion: When white eyed, yellow bodied <i>Drosophila</i> females were hybridized with red eyed, brown-bodied males; and F1 progeny was intercrossed, F2 ratio deviated from 9 : 3 : 3 : 1.</p> <p>Reason: When two genes in a dihybrid are on the same chromosome, the proportion of parental gene combinations is much higher than the non-parental type.</p>	1										
15.	<p>Assertion: Functional ADA cDNA genes must be inserted in the lymphocytes at the early embryonic stage.</p> <p>Reason: Cells in the embryonic stage are mortal, differentiated and easy to manipulate.</p>	1										
16.	<p>Given below is the Age Pyramid of population in one of the states in India as per 2011 census. It depicts the male population on the left hand side, female population on the right hand side, newborns towards the base and gradually increasing age groups as we move from base to the top, with the oldest population at the top. Study</p>	1										

this pyramid and comment upon the appropriateness of the Assertion and the Reason.



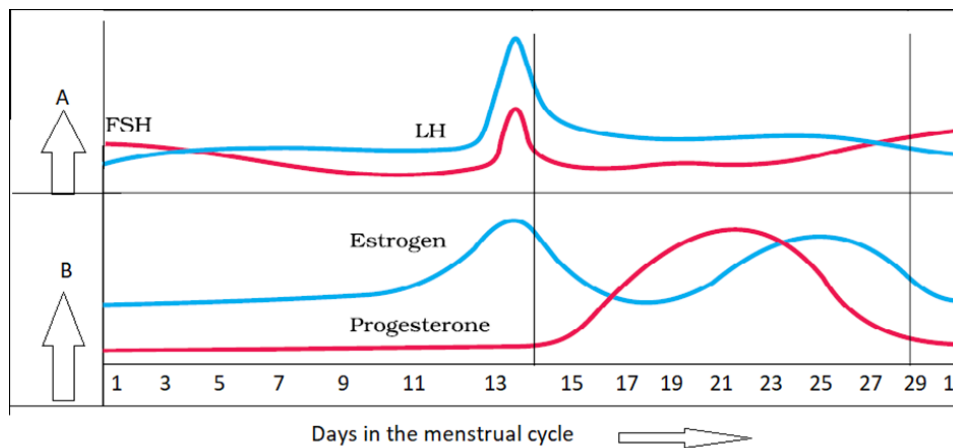
Assertion: It is a stable population.

Reason: The pre-reproductive and reproductive individuals are almost in equal numbers and the post-reproductive individuals are relatively fewer.

**SECTION - B**

17. In the figure given below, parts A and B show the level of hormones which influence the menstrual cycle. Study the figure and answer the questions that follow:

2



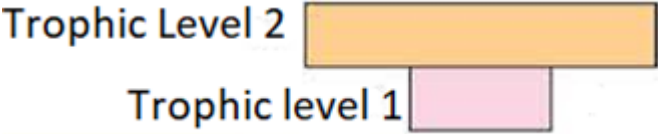
- (a) Name the organs which secrete the hormones represented in parts A and B.
- (b) State the impact of the hormones in part B on the uterus of the human female during 6 to 15 days of menstrual cycle?

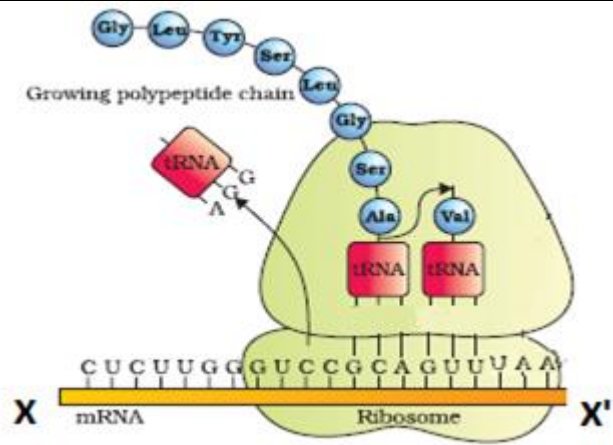
18. A true breeding pea plant, homozygous dominant for inflated green pods crossed with another pea plant with constricted yellow pods (ffgg). With the help of punnett square show the above cross and mention the results obtained phenotypically and genotypically in F1 generation?

2

19. During a field trip, one of your friend in the group suddenly became unwell, she started sneezing and had trouble in breathing. Name and explain the term associated with such sudden responses. What would the doctor recommend for relief?

2

20	<p>CTTAAG GAATTC</p> <p>(a) What are such sequences called? Name the enzyme used that recognizes such nucleotide sequences.</p> <p>(b) What is their significance in biotechnology?</p>	2
21	<p>(a) Given below is a pyramid of biomass in an ecosystem where each bar represents the standing crop available in the trophic level. With the help of an example explain the conditions where this kind of pyramid is possible in nature?</p> <div style="text-align: center;">  </div> <p>(b) Will the pyramid of energy be also of the same shape in this situation? Give reason for your response.</p> <p style="text-align: center;"><b>OR</b></p> <p>(a) Draw a pyramid of numbers where a large number of insects are feeding on the leaves of a tree. What is the shape of this pyramid?</p> <p>(b) Will the pyramid of energy be also of the same shape in this situation? Give reason for your response.</p>	2
<b>SECTION - C</b>		
22	<p>Explain the functions of the following structures in the human male reproductive system.</p> <p>(a) Scrotum (b) Leydig cells (c) Male accessory glands</p>	3
23	<p>State the agent(s) which helps in pollinating in the following plants. Explain the adaptations in these plants to ensure pollination:</p> <p>(a) Corn (b) Water hyacinth (c) Vallisneria</p>	3
24	<p>(a) Identify the polarity of x to x' in the diagram below and mention how many more amino acids are expected to be added to this polypeptide chain.</p>	3



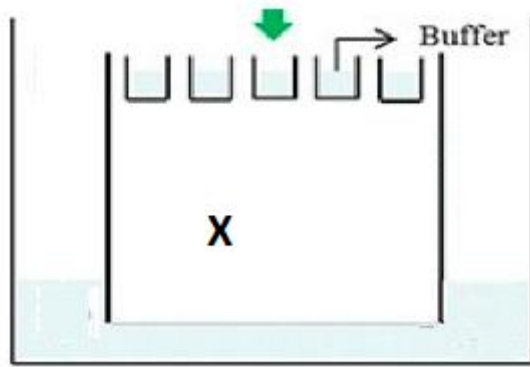
- (b) Mention the codon and anticodon for alanine.
- (c) Why are some untranslated sequences of bases seen in mRNA coding for a polypeptide? Where exactly are they present on mRNA?

25	<ul style="list-style-type: none"> <li>(a) How is Hardy-Weinberg's expression "<math>(p^2 + 2pq + q^2) = 1</math>" derived?</li> <li>(b) List any two factors that can disturb the genetic equilibrium.</li> </ul>	3
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26	<p>Highlight the structural importance of an antibody molecule with a diagram. Name the four types of antibodies found to give a humoral immune response, mentioning the functions of two of them you have studied.</p> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>(a) Explain the Life cycle of <i>Plasmodium</i> starting from its entry in the body of female <i>Anopheles</i> till the completion of its life cycle in humans.</li> <li>(b) Explain the cause of periodic recurrence of chill and high fever during malarial attack in humans.</li> </ul>	3
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27	<p>Carefully observe the given picture. A mixture of DNA with fragments ranging from 200 base pairs to 2500 base pairs was electrophoresed on agarose gel with the following arrangement.</p> <p>The diagram shows an agarose gel electrophoresis setup. The gel is rectangular with a positive terminal (+) at the top and a negative terminal (-) at the bottom. A buffer reservoir is on the right. A green arrow points to the top of the gel.</p> <ul style="list-style-type: none"> <li>(a) What result will be obtained on staining with ethidium bromide? Explain with reason.</li> <li>(b) The above set-up was modified and a band with 250 base pairs was obtained at X.</li> </ul>	3
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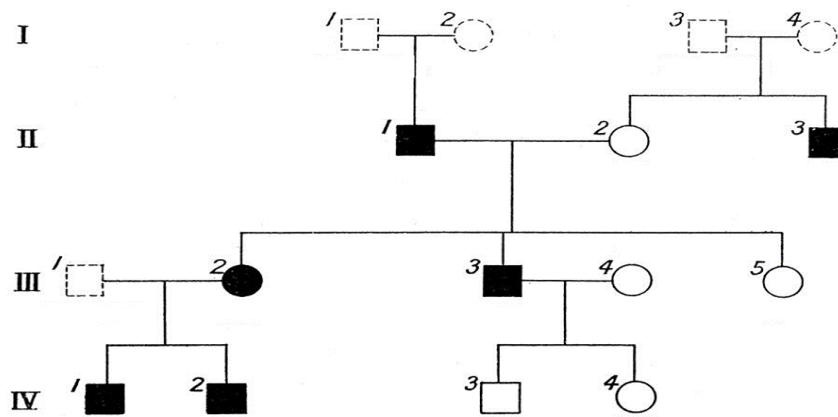
What change(s) were made to the previous design to obtain a band at X? Why did the band appear at the position X?

- 28 (a) There was loss of biodiversity in an ecosystem due to a new construction project in that area. What would be its impact on the ecosystem? State any three.
- (b) List any three major causes of loss of biodiversity?

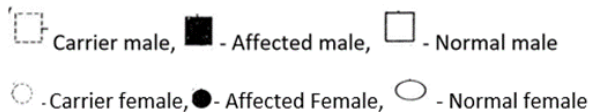
**SECTION - D**

Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.

- 29 Study the Pedigree chart given below and answer the questions that follow: 4



Symbols used in the given Pedigree Chart are as follows:



- (a) On the basis of the inheritance pattern exhibited in this pedigree chart, what conclusion can you draw about the pattern of inheritance?
- (b) If the female is homozygous for the affected trait in this pedigree chart, then what percentage of her sons will be affected ?

	<p>(c) Give the genotype of offsprings 1,2,3 and 4 in III generation.</p> <p style="text-align: center;"><b>OR</b></p> <p>(c) In this type of inheritance pattern, out of male and female children which one has less probability of receiving the trait from the parents. Give a reason.</p>																																	
30.	<p>The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/ minute.</p> <div style="text-align: center;"> <p><b>Smoking Cigarette</b></p> <table border="1"> <caption>Data points for the Smoking Cigarette graph</caption> <thead> <tr> <th>Time (minutes)</th> <th>Concentration of Nicotine in blood (mg/cm<sup>3</sup>)</th> </tr> </thead> <tbody> <tr><td>1</td><td>0</td></tr> <tr><td>2</td><td>5</td></tr> <tr><td>3</td><td>10</td></tr> <tr><td>4</td><td>15</td></tr> <tr><td>5</td><td>20</td></tr> <tr><td>6</td><td>25</td></tr> <tr><td>7</td><td>30</td></tr> <tr><td>8</td><td>35</td></tr> <tr><td>9</td><td>40</td></tr> <tr><td>10</td><td>45</td></tr> <tr><td>11</td><td>20</td></tr> <tr><td>12</td><td>18</td></tr> <tr><td>13</td><td>16</td></tr> <tr><td>14</td><td>13</td></tr> <tr><td>15</td><td>10</td></tr> </tbody> </table> </div> <p>(a) With reference to the above graph explain the concentration of nicotine in blood at 10 minutes.</p> <p>(b) How will this affect the concentration of carbon monoxide and haemoglobin oxygen at 10 minutes?</p> <p>(c) How does cigarette smoking result in high blood pressure and increase in heart rate?</p> <p style="text-align: center;"><b>OR</b></p> <p>(c) How does cigarette smoking result in lung cancer and emphysema?</p>	Time (minutes)	Concentration of Nicotine in blood (mg/cm <sup>3</sup> )	1	0	2	5	3	10	4	15	5	20	6	25	7	30	8	35	9	40	10	45	11	20	12	18	13	16	14	13	15	10	4
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<b>SECTION - E</b>																																		
31	<p>Trace the events from copulation to zygote formation in a human female.</p> <p style="text-align: center;"><b>OR</b></p> <p>Trace the development of a megaspore mother cell to the formation of mature embryo sac in a flowering plant.</p>	5																																
32.	Observe the segment of mRNA given below.	5																																



- (a) Explain and illustrate the steps involved to make fully processed hnRNA?
- (b) Gene encoding RNA Polymerase I and III have been affected by mutation in a cell. Explain its impact on the synthesis of polypeptide, stating reasons.

**OR**

Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follow:



- (a) The active site of enzyme permease present in the cell membrane of a bacterium has been blocked by an inhibitor, how will it affect the lac operon?
- (b) The protein produced by the i gene has become abnormal due to unknown reasons. Explain its impact on lactose metabolism stating the reason.
- (c) If the nutrient medium for the bacteria contains only galactose; will operon be expressed? Justify your answer.

33. Oil spill is a major environmental issue. It has been found that different strains of *Pseudomonas* bacteria have genes to break down the four major groups of hydrocarbons in oil. Trials are underway to use different biotechnological tools to incorporate these genes and create a genetically engineered strain of *Pseudomonas* - a 'super-bug', to break down the four major groups of hydrocarbons in oil. Such bacteria might be sprayed onto surfaces polluted with oil to clean thin films of oil.
- (a) List two advantages of using bacteria for such biotechnological studies?
  - (b) For amplification of the gene of interest PCR was carried out. The PCR was run with the help of polymerase which was functional only at a very low temperature. How will this impact the efficiency of the PCR? Justify.
  - (c) If such bacteria are sprayed on water bodies with oil spills, how will this have a positive or negative effect on the environment? Discuss.

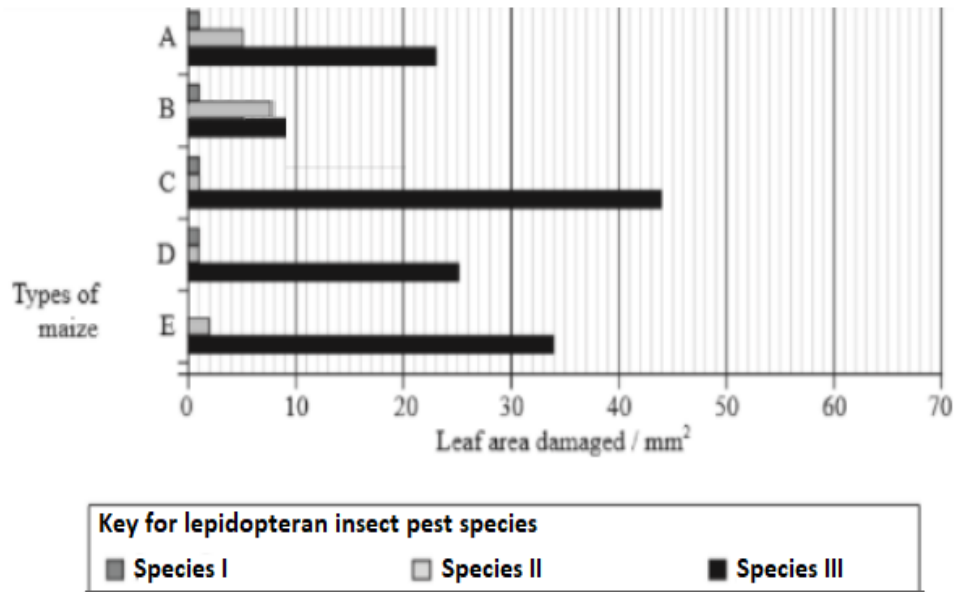
**OR**

Insects in the Lepidopteran group lay eggs on maize crops. The larvae on hatching feed on maize leaf and tender cob. In order to arrest the spread of three such Lepidopteran pests, Bt maize crops were introduced in an experimental field. A study was carried out to see which of the three species of lepidopteran pests was

most susceptible to Bt genes and its product.

The lepidopteran pests were allowed to feed on the same Bt-maize crops grown on 5 fields (A-E).

The graph below shows the leaf area damaged by these three pests after feeding on maize leaves for five days.



Insect gut pH was recorded as 10, 8 and 6 respectively for Species I, II and III respectively.

- Evaluate the efficacy of the Bt crop on the feeding habits of the three species of stem borer and suggest which species is least susceptible to Bt toxin.
- Which species is most susceptible to Bt-maize, explain why?
- Using the given information, suggest why similar effect was not seen in the three insect species?

1. Solve the question paper very neatly.  
 2. Kindly solve the assignments carefully.

class

**SECTION A: OBJECTIVE TYPE QUESTIONS**

Subject - Retail

Q. 1		Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)
i.	A mini saga is a piece of writing with exactly _____ words. a) 50 words b) 20 words c) 25 words d) 30 words	1
ii.	_____ Motivation is based on the physical needs to satisfy hunger and thirst.	1
iii.	Identify the Personality Disorder, "If a person is characterized by a pattern of persistent disregard for and violation of rights of others." a) Paranoid b) Antisocial c) Schizoid d) Avoidant	1
iv.	Functions are predefined formulae that perform calculations using specific values called arguments. (True/False)	1
v.	UNEP stands for _____.	1
vi.	In SMART Goals for an Entrepreneur, the alphabet A stands for _____. a) Artistic b) Attainable c) Available d) Attractive	1

Q. 2		Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)
i.	The person who is directly connected with rank and file or subordinates and acts as a vital link between the management subordinates _____.	1
ii.	"Dump bins" also called _____ for close out items. (buffer bins/ offer bins)	1
iii.	The retail market place is polarizing into a _____ forcing retailers to reorient their core strategies. (world of dreams/ world of extremes)	1
iv.	CMMS stands for a) Consumer Maintenance Management System b) Computerized Maintenance Management System	1

	c) Customer Maintenance Management System	
v.	Match the columns 1. Point of Production 2. Point of Storage 3. Point of Sale	1
	Retail store Factory of farm Warehouses	
vi.	The actual hiring authority for the recruit of an employee rests in the hands of a _____	1
vii.	What do you called the ability to understand and meet the needs of Customer?	1

<b>Q. 3</b>	<b>Answer any 6 out of the given 7 questions (1 x 6 = 6 marks)</b>	
i.	B2C stands for _____ in terms of online retailing.	1
ii.	_____ e-mails are the usually triggered on a customer's action with a company. (Direct e-mails/ Transactional e-mail)	1
iii.	Identify the Call Centre Technology allows people to work from home. a) Premise Call Centre Technology b) Office Call Centre Technology c) Virtual Call Centre Technology	1
iv.	The term e-business was coined by IBM's marketing and internet teams in 1996. (True/False)	1
v.	Name the marketing through Telecommunications.	1
vi.	Trace the method of advertising via e-mail whereby the recipient of the advertisement has consented to receive it.	1
vii.	_____ Readers are used to capture credit or debit card information to process sales.	1

<b>Q. 4</b>	<b>Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)</b>	
i.	POS system at retail store will most often have an _____ Cash Drawer.	1
ii.	_____ retrieve coded pricing information using laser beam for various items.	1
iii.	What refers to the area of a store where customers can pay for their purchases?	1
iv.	Identify the layout used by the modern Keyboards. qwerty layout a) Poverty layout	1

	b) Warty layout	
v.	The Point of Sale differs in a retail store and in a Restaurant. (True/False)	1
vi.	CLM stands for a) Customer Life Cycle Management b) Computerized Life Cycle Management c) Consumer Life Cycle Management d) Convergence Life Cycle Management	1

<b>Q. 5</b>	<b>Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)</b>	
i.	Name the Reporting Tool that provides MIS reports that help in decision making, analyzing the trends and competition.	1
ii.	Name the process that includes receiving and recording payments from the customers.	1
iii.	Identify the concept throws light on the point that each transaction as two folds affect such as receiving and giving of the benefits. a) Dual aspect concern b) The cost concepts c) Going concern concept d) Business entity concept	1
iv.	Conventions are the customs or traditions guiding the preparation of accounting statements. (State True/ False)	1
v.	The important branches of accounting are: a) Financial Accounting b) Cost Accounting c) Management Accounting d) All of the above	1
vi.	Billing accuracy is most important factor for: a) Customer satisfaction b) Reseller satisfaction c) Purchase satisfaction d) None of the above	1

<b>Q. 6</b>	<b>Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)</b>	
i.	Which of the following methods it does not require daily monitoring of inventory traffic and figures? a) Perpetual method b) Periodic method	1

	c) Precise method	1
ii.	LIFO stands for a) Least in first out b) Low in first out c) Last in first out	1
iii.	Running out of the inventory of an SKU means _____. a) Stock out b) Stock in c) Stock keeping	1
iv.	Inventory means a list of goods and materials available in stock by a business. (True/ False)	1
v.	Name the term used in business to refer to merchandise being offered for sale that was manufactured long ago but that has never been used.	1
vi.	SKU stands for _____.	1

### **SECTION B: SUBJECTIVE TYPE QUESTIONS**

**Answer any 3 out of the given 5 questions on Employability Skills (2 x 3 = 6 marks)**

**Answer each question in 20 – 30 words.**

Q 7	List out the four steps of Active listening.	2
Q 8	Write the importance of Self-motivation	2
Q 9	What is the use of MIN function in Open Office Calc.	2
Q 10	Define the term Biofuel.	2
Q 11	What do you understand by Entrepreneurial Competencies?	2

**Answer any 3 out of the given 5 questions in 20 – 30 words each (2 x 3 = 6 marks)**

Q 12	List out the Elements of Visual Merchandising.	2
Q 13	Give the two steps involved to a successful and accurate physical inventory handling Process-I	2
Q 14	Mention the key requirements that must be met by Modern POS system.	2
Q 15	Write the two broad categories of POS system.	2
Q 16	What are the main objectives of Accounting?	2

**Answer any 2 out of the given 3 questions in 50– 80 words each (3 x 2 = 6 marks)**

Q 17	State the advantages of Telemarketing.	3
Q 18	Keyboards are used with back office server. Explain the function of Keyboard.	3
Q 19	“E-Shopping is becoming popular now a days”. Accordingly Justify the statement by mentioning the important features of E-Shop.	3



Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)

Q. 20	"The organization and the Store are built from the Customer Perspective". Investigate the statement to be Customer Centric and List out the strategies.	4
Q. 21	According to you, what are the three basic reasons for keeping an Inventory?	4
Q. 22	Distinguish between Book Keeping and Accounting.	4
Q. 23	"The key components of POS system work together in synchronization to give the best results to the Retailer". List out the procedure steps of working.	4
Q. 24	"Accounting is useful to the management as well as other users". Clarify the statement by providing the functions of Accounting.	4

12. Fine Arts  
Assignment

20 Marks

- Q- what is the speciality of the Rajasthani painting 'Bhanu meet Rama at Chitrakuta'?
- Q- why do you like or dislike the 'pahari' miniatures? Give appropriate reasons in short.
- Q- write a short note on the symbolic significance of the forms and colours of the Indian National flag.
- Q- Evaluate the compositional arrangement of the graphic print 'Of walls' duty' based on the aesthetic - parameters briefly.
- Q- write an essay on the evolution of Indian National flag and symbolic significance of its forms and colours.
- Q- which human life-values and emotions are shown in the art work 'Children' (a graphic-print), of the contemporary Indian art?

## practical work

Complete your practical file

- 15 sheets
- 5 Landscapes
- 5 Compositions
- 5 Still life

Size - A2 Sheet

72 Linesets

PAGE

DATE

## Assignment II

20 marks

Q- write a short note on the compositional arrangement of the Mughal painting 'Krishna Lifting Mount Govardhan'.

Q- Write a note on the subject matter of the Deccani painting 'Chand Bibi playing polo'.

Q- Describe the main features of the Bengal School of Painting.

Q- write a short note on the modern Trends in Indian Art:

Q- Write a note on the Deccani painting 'Hazrat Nizamuddin Auliya and Amir Khudro'.

- Name of the painter/artist and sub-school
- medium and Technique.
- Subject-matter
- Composition.

Q- write a critical note on the compositional arrangement of the painting from Bengal School 'Rama Vanquishing the pride of the Ocean' based on the asthetical parameters

## Practical work

- Complete your practical file

Total 15 Sheets

- 5 Compositions

- 5 Landscapes

- 5 Still Life

Size - A3