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| Paper:      | B.E_B.Tech   |
| Set Name:   | Set 08       |
| Exam Date:  | 26 July 2022 |
| Exam Shift: | 2            |
| Language:   | English      |

|                |                                                                                           |
|----------------|-------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                     |
| Item No:       | 1                                                                                         |
| Question ID:   | <b>144961</b>                                                                             |
| Question Type: | MCQ                                                                                       |
| Question:      | The minimum value of the sum of the squares of the roots of $x^2 + (3 - a)x + 1 = 2a$ is: |
| A:             | 4                                                                                         |
| B:             | 5                                                                                         |
| C:             | 6                                                                                         |
| D:             | 8                                                                                         |

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| Topic:         | Mathematics-Section A                                                       |
| Item No:       | 2                                                                           |
| Question ID:   | <b>144962</b>                                                               |
| Question Type: | MCQ                                                                         |
| Question:      | If $z = x + iy$ satisfies $ z  - 2 = 0$ and $ z - i  -  z + 5i  = 0$ , then |
| A:             | $x + 2y - 4 = 0$                                                            |
| B:             | $x^2 + y - 4 = 0$                                                           |
| C:             | $x + 2y + 4 = 0$                                                            |
| D:             | $x^2 - y + 3 = 0$                                                           |

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| Topic:         | Mathematics-Section A                                                                                                                                                                       |
| Item No:       | 3                                                                                                                                                                                           |
| Question ID:   | <b>144963</b>                                                                                                                                                                               |
| Question Type: | MCQ                                                                                                                                                                                         |
| Question:      | Let $A = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and $B = \begin{bmatrix} 9^2 & -10^2 & 11^2 \\ 12^2 & 13^2 & -14^2 \\ -15^2 & 16^2 & 17^2 \end{bmatrix}$ , then the value of $A'BA$ is: |
| A:             | 1224                                                                                                                                                                                        |
| B:             | 1042                                                                                                                                                                                        |
| C:             | 540                                                                                                                                                                                         |

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| D: | 539 |
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| Topic:         | Mathematics-Section A                                               |
| Item No:       | 4                                                                   |
| Question ID:   | 144964                                                              |
| Question Type: | MCQ                                                                 |
| Question:      | $\sum_{\substack{i,j=0 \\ i \neq j}}^n {}^nC_i {}^nC_j$ is equal to |
| A:             | $2^{2n} - 2^n C_n$                                                  |
| B:             | $2^{2n-1} - {}^{2n-1}C_{n-1}$                                       |
| C:             | $2^{2n} - \frac{1}{2} {}^{2n}C_n$                                   |
| D:             | $2^{n-1} + {}^{2n-1}C_n$                                            |

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| Topic:         | Mathematics-Section A                                                                                                                                                                     |
| Item No:       | 5                                                                                                                                                                                         |
| Question ID:   | 144965                                                                                                                                                                                    |
| Question Type: | MCQ                                                                                                                                                                                       |
| Question:      | Let P and Q be any points on the curves $(x-1)^2 + (y+1)^2 = 1$ and $y = x^2$ , respectively. The distance between P and Q is minimum for some value of the abscissa of P in the interval |
| A:             | $\left(0, \frac{1}{4}\right)$                                                                                                                                                             |
| B:             | $\left(\frac{1}{2}, \frac{3}{4}\right)$                                                                                                                                                   |
| C:             | $\left(\frac{1}{4}, \frac{1}{2}\right)$                                                                                                                                                   |
| D:             | $\left(\frac{3}{4}, 1\right)$                                                                                                                                                             |

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| Topic:         | Mathematics-Section A                                                                                                                                                                                                              |
| Item No:       | 6                                                                                                                                                                                                                                  |
| Question ID:   | 144966                                                                                                                                                                                                                             |
| Question Type: | MCQ                                                                                                                                                                                                                                |
| Question:      | If the maximum value of $a$ , for which the function $f_a(x) = \tan^{-1} 2x - 3ax + 7$ is non-decreasing in $\left(-\frac{\pi}{6}, \frac{\pi}{6}\right)$ , is $\bar{a}$ , then $f_{\bar{a}}\left(\frac{\pi}{8}\right)$ is equal to |

|    |                                            |
|----|--------------------------------------------|
| A: | $8 - \frac{9\pi}{4(9+\pi^2)}$              |
| B: | $8 - \frac{4\pi}{9(4+\pi^2)}$              |
| C: | $8 \left( \frac{1+\pi^2}{9+\pi^2} \right)$ |
| D: | $8 - \frac{\pi}{4}$                        |

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| Topic:         | Mathematics-Section A                                                                                                                                                 |
| Item No:       | 7                                                                                                                                                                     |
| Question ID:   | <b>144967</b>                                                                                                                                                         |
| Question Type: | MCQ                                                                                                                                                                   |
| Question:      | Let $\beta = \lim_{x \rightarrow 0} \frac{\alpha x - (e^{3x} - 1)}{\alpha x (e^{3x} - 1)}$ for some $\alpha \in \mathbb{R}$ . Then the value of $\alpha + \beta$ is : |
| A:             | $\frac{14}{5}$                                                                                                                                                        |
| B:             | $\frac{3}{2}$                                                                                                                                                         |
| C:             | $\frac{5}{2}$                                                                                                                                                         |
| D:             | $\frac{7}{2}$                                                                                                                                                         |

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| Topic:         | Mathematics-Section A                                                                                 |
| Item No:       | 8                                                                                                     |
| Question ID:   | <b>144968</b>                                                                                         |
| Question Type: | MCQ                                                                                                   |
| Question:      | The value of $\log_e 2 \frac{d}{dx} (\log_{\cos x} \operatorname{cosec} x)$ at $x = \frac{\pi}{4}$ is |
| A:             | $-2\sqrt{2}$                                                                                          |
| B:             | $2\sqrt{2}$                                                                                           |
| C:             | $-4$                                                                                                  |
| D:             | $4$                                                                                                   |

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| Topic:         | Mathematics-Section A |
| Item No:       | 9                     |
| Question ID:   | <b>144969</b>         |
| Question Type: | MCQ                   |

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| Question: | $\int_0^{20\pi} ( \sin x  +  \cos x )^2 dx$ is equal to |
| A:        | $10(\pi + 4)$                                           |
| B:        | $10(\pi + 2)$                                           |
| C:        | $20(\pi - 2)$                                           |
| D:        | $20(\pi + 2)$                                           |

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| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                       |
| Item No:       | 10                                                                                                                                                                                                                                                          |
| Question ID:   | <b>1449610</b>                                                                                                                                                                                                                                              |
| Question Type: | MCQ                                                                                                                                                                                                                                                         |
| Question:      | Let the solution curve $y = f(x)$ of the differential equation $\frac{dy}{dx} + \frac{xy}{x^2 - 1} = \frac{x^4 + 2x}{\sqrt{1 - x^2}}$ , $x \in (-1, 1)$ pass through the origin. Then $\int_{-\frac{\sqrt{3}}{2}}^{\frac{\sqrt{3}}{2}} f(x) dx$ is equal to |
| A:             | $\frac{\pi}{3} - \frac{1}{4}$                                                                                                                                                                                                                               |
| B:             | $\frac{\pi}{3} - \frac{\sqrt{3}}{4}$                                                                                                                                                                                                                        |
| C:             | $\frac{\pi}{6} - \frac{\sqrt{3}}{4}$                                                                                                                                                                                                                        |
| D:             | $\frac{\pi}{6} - \frac{\sqrt{3}}{2}$                                                                                                                                                                                                                        |

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| Topic:         | Mathematics-Section A                                                                                          |
| Item No:       | 11                                                                                                             |
| Question ID:   | <b>1449611</b>                                                                                                 |
| Question Type: | MCQ                                                                                                            |
| Question:      | The acute angle between the pair of tangents drawn to the ellipse $2x^2 + 3y^2 = 5$ from the point $(1, 3)$ is |
| A:             | $\tan^{-1}\left(\frac{16}{7\sqrt{5}}\right)$                                                                   |
| B:             | $\tan^{-1}\left(\frac{24}{7\sqrt{5}}\right)$                                                                   |

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| C: | $\tan^{-1}\left(\frac{32}{7\sqrt{5}}\right)$   |
| D: | $\tan^{-1}\left(\frac{3+8\sqrt{5}}{35}\right)$ |

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| Topic:         | Mathematics-Section A                                                               |
| Item No:       | 12                                                                                  |
| Question ID:   | <b>1449612</b>                                                                      |
| Question Type: | MCQ                                                                                 |
| Question:      | The equation of a common tangent to the parabolas $y = x^2$ and $y = -(x - 2)^2$ is |
| A:             | $y = 4(x - 2)$                                                                      |
| B:             | $y = 4(x - 1)$                                                                      |
| C:             | $y = 4(x + 1)$                                                                      |
| D:             | $y = 4(x + 2)$                                                                      |

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| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                      |
| Item No:       | 13                                                                                                                                                                                                                                                                         |
| Question ID:   | <b>1449613</b>                                                                                                                                                                                                                                                             |
| Question Type: | MCQ                                                                                                                                                                                                                                                                        |
| Question:      | Let the abscissae of the two points P and Q on a circle be the roots of $x^2 - 4x - 6 = 0$ and the ordinates of P and Q be the roots of $y^2 + 2y - 7 = 0$ . If PQ is a diameter of the circle $x^2 + y^2 + 2ax + 2by + c = 0$ , then the value of $(a + b - c)$ is _____. |
| A:             | 12                                                                                                                                                                                                                                                                         |
| B:             | 13                                                                                                                                                                                                                                                                         |
| C:             | 14                                                                                                                                                                                                                                                                         |
| D:             | 16                                                                                                                                                                                                                                                                         |

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| Topic:         | Mathematics-Section A                                                                                                  |
| Item No:       | 14                                                                                                                     |
| Question ID:   | <b>1449614</b>                                                                                                         |
| Question Type: | MCQ                                                                                                                    |
| Question:      | If the line $x - 1 = 0$ is a directrix of the hyperbola $kx^2 - y^2 = 6$ , then the hyperbola passes through the point |
| A:             | $(-2\sqrt{5}, 6)$                                                                                                      |
| B:             | $(-\sqrt{5}, 3)$                                                                                                       |

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| C: | $(\sqrt{5}, -2)$         |
| D: | $(2\sqrt{5}, 3\sqrt{6})$ |

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| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                                                          |
| Item No:       | 15                                                                                                                                                                                                                                                                                                             |
| Question ID:   | <b>1449615</b>                                                                                                                                                                                                                                                                                                 |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                            |
| Question:      | A vector $\vec{a}$ is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i} + \hat{j}$ and the plane determined by the vectors $\hat{i} - \hat{j}, \hat{i} + \hat{k}$ . The obtuse angle between $\vec{a}$ and the vector $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$ is |
| A:             | $\frac{3\pi}{4}$                                                                                                                                                                                                                                                                                               |
| B:             | $\frac{2\pi}{3}$                                                                                                                                                                                                                                                                                               |
| C:             | $\frac{4\pi}{5}$                                                                                                                                                                                                                                                                                               |
| D:             | $\frac{5\pi}{6}$                                                                                                                                                                                                                                                                                               |

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| Topic:         | Mathematics-Section A                                                                                                                                                  |
| Item No:       | 16                                                                                                                                                                     |
| Question ID:   | <b>1449616</b>                                                                                                                                                         |
| Question Type: | MCQ                                                                                                                                                                    |
| Question:      | If $0 < x < \frac{1}{\sqrt{2}}$ and $\frac{\sin^{-1} x}{\alpha} = \frac{\cos^{-1} x}{\beta}$ , then a value of $\sin\left(\frac{2\pi\alpha}{\alpha + \beta}\right)$ is |
| A:             | $4\sqrt{(1-x^2)}(1-2x^2)$                                                                                                                                              |
| B:             | $4x\sqrt{(1-x^2)}(1-2x^2)$                                                                                                                                             |
| C:             | $2x\sqrt{(1-x^2)}(1-4x^2)$                                                                                                                                             |
| D:             | $4\sqrt{(1-x^2)}(1-4x^2)$                                                                                                                                              |

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| Topic:         | Mathematics-Section A |
| Item No:       | 17                    |
| Question ID:   | <b>1449617</b>        |
| Question Type: | MCQ                   |

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| Question: | Negation of the Boolean expression $p \Leftrightarrow (q \Rightarrow p)$ is |
| A:        | $(\sim p) \wedge q$                                                         |
| B:        | $p \wedge (\sim q)$                                                         |
| C:        | $(\sim p) \vee (\sim q)$                                                    |
| D:        | $(\sim p) \wedge (\sim q)$                                                  |

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| Topic:         | Mathematics-Section A                                                                                                              |
| Item No:       | 18                                                                                                                                 |
| Question ID:   | <b>1449618</b>                                                                                                                     |
| Question Type: | MCQ                                                                                                                                |
| Question:      | Let $X$ be a binomially distributed random variable with mean 4 and variance $\frac{4}{3}$ .<br>Then, $54 P(X \leq 2)$ is equal to |
| A:             | $\frac{73}{27}$                                                                                                                    |
| B:             | $\frac{146}{27}$                                                                                                                   |
| C:             | $\frac{146}{81}$                                                                                                                   |
| D:             | $\frac{126}{81}$                                                                                                                   |

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| Topic:         | Mathematics-Section A                                                                                                                       |
| Item No:       | 19                                                                                                                                          |
| Question ID:   | <b>1449619</b>                                                                                                                              |
| Question Type: | MCQ                                                                                                                                         |
| Question:      | The integral $\int \frac{\left(1 - \frac{1}{\sqrt{3}}\right)(\cos x - \sin x)}{\left(1 + \frac{2}{\sqrt{3}} \sin 2x\right)} dx$ is equal to |
| A:             | $\frac{1}{2} \log_e \left  \frac{\tan\left(\frac{x}{2} + \frac{\pi}{12}\right)}{\tan\left(\frac{x}{2} + \frac{\pi}{6}\right)} \right  + C$  |
| B:             | $\frac{1}{2} \log_e \left  \frac{\tan\left(\frac{x}{2} + \frac{\pi}{6}\right)}{\tan\left(\frac{x}{2} + \frac{\pi}{3}\right)} \right  + C$   |

|    |                                                                                                                                            |
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| C: | $\log_e \left  \frac{\tan\left(\frac{x}{2} + \frac{\pi}{6}\right)}{\tan\left(\frac{x}{2} + \frac{\pi}{12}\right)} \right  + C$             |
| D: | $\frac{1}{2} \log_e \left  \frac{\tan\left(\frac{x}{2} - \frac{\pi}{12}\right)}{\tan\left(\frac{x}{2} - \frac{\pi}{6}\right)} \right  + C$ |

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| Topic:         | Mathematics-Section A                                         |
| Item No:       | 20                                                            |
| Question ID:   | <b>1449620</b>                                                |
| Question Type: | MCQ                                                           |
| Question:      | The area bounded by the curves $y =  x^2 - 1 $ and $y = 1$ is |
| A:             | $\frac{2}{3}(\sqrt{2} + 1)$                                   |
| B:             | $\frac{4}{3}(\sqrt{2} - 1)$                                   |
| C:             | $2(\sqrt{2} - 1)$                                             |
| D:             | $\frac{8}{3}(\sqrt{2} - 1)$                                   |

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| Topic:         | Mathematics-Section B                                                                                                                                  |
| Item No:       | 21                                                                                                                                                     |
| Question ID:   | <b>1449621</b>                                                                                                                                         |
| Question Type: | Numeric Answer                                                                                                                                         |
| Question:      | Let $A = \{1, 2, 3, 4, 5, 6, 7\}$ and $B = \{3, 6, 7, 9\}$ . Then the number of elements in the set $\{C \subseteq A : C \cap B \neq \phi\}$ is _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                                                   |
| Item No:       | 22                                                                                                                                                                                                                                                                                                      |
| Question ID:   | <b>1449622</b>                                                                                                                                                                                                                                                                                          |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                          |
| Question:      | The largest value of $a$ , for which the perpendicular distance of the plane containing the lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + a\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - a\hat{k})$ from the point $(2, 1, 4)$ is $\sqrt{3}$ , is _____. |



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| Topic:         | Mathematics-Section B                                                                                                                                                                        |
| Item No:       | 23                                                                                                                                                                                           |
| Question ID:   | <b>1449623</b>                                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                                               |
| Question:      | Numbers are to be formed between 1000 and 3000, which are divisible by 4, using the digits 1, 2, 3, 4, 5 and 6 without repetition of digits. Then the total number of such numbers is _____. |

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| Topic:         | Mathematics-Section B                                                                                                        |
| Item No:       | 24                                                                                                                           |
| Question ID:   | <b>1449624</b>                                                                                                               |
| Question Type: | Numeric Answer                                                                                                               |
| Question:      | If $\sum_{k=1}^{10} \frac{k}{k^4 + k^2 + 1} = \frac{m}{n}$ , where $m$ and $n$ are co-prime, then $m + n$ is equal to _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                                           |
| Item No:       | 25                                                                                                                                                                                              |
| Question ID:   | <b>1449625</b>                                                                                                                                                                                  |
| Question Type: | Numeric Answer                                                                                                                                                                                  |
| Question:      | If the sum of solutions of the system of equations $2\sin^2\theta - \cos 2\theta = 0$ and $2\cos^2\theta + 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is $k\pi$ , then $k$ is equal to _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                                                        |
| Item No:       | 26                                                                                                                                                                                                                                                                                                           |
| Question ID:   | <b>1449626</b>                                                                                                                                                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                               |
| Question:      | The mean and standard deviation of 40 observations are 30 and 5 respectively. It was noticed that two of these observations 12 and 10 were wrongly recorded. If $\sigma$ is the standard deviation of the data after omitting the two wrong observations from the data, then $38\sigma^2$ is equal to _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                        |
| Item No:       | 27                                                                                                                                                                                                                                                                           |
| Question ID:   | <b>1449627</b>                                                                                                                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                               |
| Question:      | The plane passing through the line $L: lx - y + 3(1 - l)z = 1$ , $x + 2y - z = 2$ and perpendicular to the plane $3x + 2y + z = 6$ is $3x - 8y + 7z = 4$ . If $\theta$ is the acute angle between the line $L$ and the $y$ -axis, then $415 \cos^2\theta$ is equal to _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                                                                |
| Item No:       | 28                                                                                                                                                                                                                                                                                                                   |
| Question ID:   | <b>1449628</b>                                                                                                                                                                                                                                                                                                       |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                       |
| Question:      | Suppose $y = y(x)$ be the solution curve to the differential equation $\frac{dy}{dx} - y = 2 - e^{-x}$ such that $\lim_{x \rightarrow \infty} y(x)$ is finite. If $a$ and $b$ are respectively the $x$ - and $y$ - intercepts of the tangent to the curve at $x = 0$ , then the value of $a - 4b$ is equal to _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                                                                     |
| Item No:       | 29                                                                                                                                                                                                                        |
| Question ID:   | <b>1449629</b>                                                                                                                                                                                                            |
| Question Type: | Numeric Answer                                                                                                                                                                                                            |
| Question:      | Different A.P.'s are constructed with the first term 100, the last term 199, and integral common differences. The sum of the common differences of all such A.P.'s having at least 3 terms and at most 33 terms is _____. |

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| Topic:         | Mathematics-Section B                                                                                                                                                 |
| Item No:       | 30                                                                                                                                                                    |
| Question ID:   | <b>1449630</b>                                                                                                                                                        |
| Question Type: | Numeric Answer                                                                                                                                                        |
| Question:      | The number of matrices $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ , where $a, b, c, d \in \{-1, 0, 1, 2, 3, \dots, 10\}$ , such that $A = A^{-1}$ , is _____. |

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| Topic:         | Physics-Section A                                                                                                                                                                   |
| Item No:       | 31                                                                                                                                                                                  |
| Question ID:   | <b>1449631</b>                                                                                                                                                                      |
| Question Type: | MCQ                                                                                                                                                                                 |
| Question:      | Two projectiles are thrown with same initial velocity making an angle of $45^\circ$ and $30^\circ$ with the horizontal respectively. The ratio of their respective ranges will be : |
| A:             | $1:\sqrt{2}$                                                                                                                                                                        |
| B:             | $\sqrt{2}:1$                                                                                                                                                                        |
| C:             | $2:\sqrt{3}$                                                                                                                                                                        |
| D:             | $\sqrt{3}:2$                                                                                                                                                                        |

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| Topic:       | Physics-Section A |
| Item No:     | 32                |
| Question ID: | <b>1449632</b>    |

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| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Question:      | In a Vernier Calipers, 10 divisions of Vernier scale is equal to the 9 divisions of main scale. When both jaws of Vernier calipers touch each other, the zero of the Vernier scale is shifted to the left of zero of the main scale and 4 <sup>th</sup> Vernier scale division exactly coincides with the main scale reading. One main scale division is equal to 1 mm. While measuring diameter of a spherical body, the body is held between two jaws. It is now observed that zero of the Vernier scale lies between 30 and 31 divisions of main scale reading and 6 <sup>th</sup> Vernier scale division exactly coincides with the main scale reading. The diameter of the spherical body will be : |
| A:             | 3.02 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| B:             | 3.06 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| C:             | 3.10 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| D:             | 3.20 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                    |
| Item No:       | 33                                                                                                                                                                                                                                                                                   |
| Question ID:   | <b>1449633</b>                                                                                                                                                                                                                                                                       |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                  |
| Question:      | A ball of mass 0.15 kg hits the wall with its initial speed of $12 \text{ ms}^{-1}$ and bounces back without changing its initial speed. If the force applied by the wall on the ball during the contact is 100 N, calculate the time duration of the contact of ball with the wall. |
| A:             | 0.018 s                                                                                                                                                                                                                                                                              |
| B:             | 0.036 s                                                                                                                                                                                                                                                                              |
| C:             | 0.009 s                                                                                                                                                                                                                                                                              |
| D:             | 0.072 s                                                                                                                                                                                                                                                                              |

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| Topic:         | Physics-Section A                                                                                                                  |
| Item No:       | 34                                                                                                                                 |
| Question ID:   | <b>1449634</b>                                                                                                                     |
| Question Type: | MCQ                                                                                                                                |
| Question:      | A body of mass 8 kg and another of mass 2 kg are moving with equal kinetic energy. The ratio of their respective momenta will be : |
| A:             | 1:1                                                                                                                                |
| B:             | 2:1                                                                                                                                |
| C:             | 1:4                                                                                                                                |
| D:             | 4:1                                                                                                                                |

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| Topic:   | Physics-Section A |
| Item No: | 35                |

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| Question ID:   | <b>1449635</b>                                                                                                                                                                                                                                                                                              |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                         |
| Question:      | Two uniformly charged spherical conductors $A$ and $B$ of radii 5 mm and 10 mm are separated by a distance of 2 cm. If the spheres are connected by a conducting wire, then in equilibrium condition, the ratio of the magnitudes of the electric fields at the surface of the sphere $A$ and $B$ will be : |
| A:             | 1:2                                                                                                                                                                                                                                                                                                         |
| B:             | 2:1                                                                                                                                                                                                                                                                                                         |
| C:             | 1:1                                                                                                                                                                                                                                                                                                         |
| D:             | 1:4                                                                                                                                                                                                                                                                                                         |

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| Topic:         | Physics-Section A                                                                                                                                                                      |
| Item No:       | 36                                                                                                                                                                                     |
| Question ID:   | <b>1449636</b>                                                                                                                                                                         |
| Question Type: | MCQ                                                                                                                                                                                    |
| Question:      | The oscillating magnetic field in a plane electromagnetic wave is given by $B_y = 5 \times 10^{-6} \sin 1000\pi(5x - 4 \times 10^8 t)T$ .<br>The amplitude of electric field will be : |
| A:             | $15 \times 10^2 \text{ Vm}^{-1}$                                                                                                                                                       |
| B:             | $5 \times 10^{-6} \text{ Vm}^{-1}$                                                                                                                                                     |
| C:             | $16 \times 10^{12} \text{ Vm}^{-1}$                                                                                                                                                    |
| D:             | $4 \times 10^2 \text{ Vm}^{-1}$                                                                                                                                                        |

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| Topic:         | Physics-Section A                                                                                                                                                                 |
| Item No:       | 37                                                                                                                                                                                |
| Question ID:   | <b>1449637</b>                                                                                                                                                                    |
| Question Type: | MCQ                                                                                                                                                                               |
| Question:      | Light travels in two media $M_1$ and $M_2$ with speeds $1.5 \times 10^8 \text{ ms}^{-1}$ and $2.0 \times 10^8 \text{ ms}^{-1}$ respectively. The critical angle between them is : |
| A:             | $\tan^{-1}\left(\frac{3}{\sqrt{7}}\right)$                                                                                                                                        |
| B:             | $\tan^{-1}\left(\frac{2}{3}\right)$                                                                                                                                               |
| C:             | $\cos^{-1}\left(\frac{3}{4}\right)$                                                                                                                                               |
| D:             | $\sin^{-1}\left(\frac{2}{3}\right)$                                                                                                                                               |

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| Topic: | Physics-Section A |
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| Item No:       | 38                                                                                                                                                                                                                                        |
| Question ID:   | <b>1449638</b>                                                                                                                                                                                                                            |
| Question Type: | MCQ                                                                                                                                                                                                                                       |
| Question:      | A body is projected vertically upwards from the surface of earth with a velocity equal to one third of escape velocity. The maximum height attained by the body will be :<br>(Take radius of earth = 6400 km and $g=10 \text{ ms}^{-2}$ ) |
| A:             | 800 km                                                                                                                                                                                                                                    |
| B:             | 1600 km                                                                                                                                                                                                                                   |
| C:             | 2133 km                                                                                                                                                                                                                                   |
| D:             | 4800 km                                                                                                                                                                                                                                   |

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| Topic:         | Physics-Section A                                                                                                                          |
| Item No:       | 39                                                                                                                                         |
| Question ID:   | <b>1449639</b>                                                                                                                             |
| Question Type: | MCQ                                                                                                                                        |
| Question:      | The maximum and minimum voltage of an amplitude modulated signal are 60 V and 20 V respectively. The percentage modulation index will be : |
| A:             | 0.5%                                                                                                                                       |
| B:             | 50%                                                                                                                                        |
| C:             | 2%                                                                                                                                         |
| D:             | 30%                                                                                                                                        |

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| Topic:         | Physics-Section A                                                                                                                                                           |
| Item No:       | 40                                                                                                                                                                          |
| Question ID:   | <b>1449640</b>                                                                                                                                                              |
| Question Type: | MCQ                                                                                                                                                                         |
| Question:      | A nucleus of mass M at rest splits into two parts having masses $\frac{M'}{3}$ and $\frac{2M'}{3}$ ( $M' < M$ ) . The ratio of de Broglie wavelength of two parts will be : |
| A:             | 1:2                                                                                                                                                                         |
| B:             | 2:1                                                                                                                                                                         |
| C:             | 1:1                                                                                                                                                                         |
| D:             | 2:3                                                                                                                                                                         |

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| Topic:       | Physics-Section A |
| Item No:     | 41                |
| Question ID: | <b>1449641</b>    |

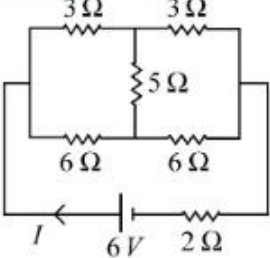


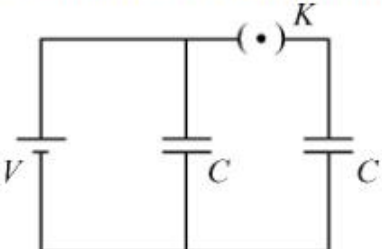
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| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Question:      | An ice cube of dimensions $60\text{ cm} \times 50\text{ cm} \times 20\text{ cm}$ is placed in an insulation box of wall thickness $1\text{ cm}$ . The box keeping the ice cube at $0^\circ\text{C}$ of temperature is brought to a room of temperature $40^\circ\text{C}$ . The rate of melting of ice is approximately :<br>(Latent heat of fusion of ice is $3.4 \times 10^5\text{ J kg}^{-1}$ and thermal conducting of insulation wall is $0.05\text{ Wm}^{-1}\text{C}^{-1}$ ) |
| A:             | $61 \times 10^{-3}\text{ kg s}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| B:             | $61 \times 10^{-5}\text{ kg s}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| C:             | $208\text{ kg s}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| D:             | $30 \times 10^{-5}\text{ kg s}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| Topic:         | Physics-Section A                                                                                                                                 |
| Item No:       | 42                                                                                                                                                |
| Question ID:   | <b>1449642</b>                                                                                                                                    |
| Question Type: | MCQ                                                                                                                                               |
| Question:      | A gas has $n$ degrees of freedom. The ratio of specific heat of gas at constant volume to the specific heat of gas at constant pressure will be : |
| A:             | $\frac{n}{n+2}$                                                                                                                                   |
| B:             | $\frac{n+2}{n}$                                                                                                                                   |
| C:             | $\frac{n}{2n+2}$                                                                                                                                  |
| D:             | $\frac{n}{n-2}$                                                                                                                                   |

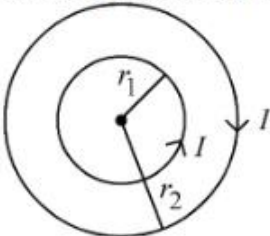
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| Topic:         | Physics-Section A                                                                                                                                                                        |
| Item No:       | 43                                                                                                                                                                                       |
| Question ID:   | <b>1449643</b>                                                                                                                                                                           |
| Question Type: | MCQ                                                                                                                                                                                      |
| Question:      | A transverse wave is represented by $y = 2\sin(\omega t - kx)$ cm. The value of wavelength (in cm) for which the wave velocity becomes equal to the maximum particle velocity, will be : |
| A:             | $4\pi$                                                                                                                                                                                   |
| B:             | $2\pi$                                                                                                                                                                                   |
| C:             | $\pi$                                                                                                                                                                                    |
| D:             | 2                                                                                                                                                                                        |

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| Topic: | Physics-Section A |
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| Item No:       | 44                                                                                                                                                                                                                       |
| Question ID:   | 1449644                                                                                                                                                                                                                  |
| Question Type: | MCQ                                                                                                                                                                                                                      |
| Question:      | <p>A battery of <math>6V</math> is connected to the circuit as shown below. The current <math>I</math> drawn from the battery is :</p>  |
| A:             | $1A$                                                                                                                                                                                                                     |
| B:             | $2A$                                                                                                                                                                                                                     |
| C:             | $\frac{6}{11} A$                                                                                                                                                                                                         |
| D:             | $\frac{4}{3} A$                                                                                                                                                                                                          |

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| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Item No:       | 45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Question ID:   | 1449645                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Question:      | <p>A source of potential difference <math>V</math> is connected to the combination of two identical capacitors as shown in the figure. When key '<math>K</math>' is closed, the total energy stored across the combination is <math>E_1</math>. Now key '<math>K</math>' is opened and dielectric of dielectric constant 5 is introduced between the plates of the capacitors. The total energy stored across the combination is now <math>E_2</math>. The ratio <math>E_1/E_2</math> will be :</p>  |
| A:             | $\frac{1}{10}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| B:             | $\frac{2}{5}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| C:             | $\frac{5}{13}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| D:             | $\frac{5}{26}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

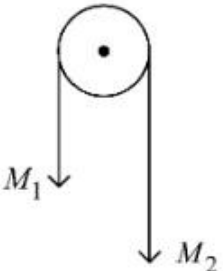
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| Topic: | Physics-Section A |
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| Item No:       | 46                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Question ID:   | <b>1449646</b>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Question:      | <p>Two concentric circular loops of radii <math>r_1=30\text{ cm}</math> and <math>r_2=50\text{ cm}</math> are placed in X-Y plane as shown in the figure. A current <math>I = 7\text{ A}</math> is flowing through them in the direction as shown in figure. The net magnetic moment of this system of two circular loops is approximately :</p>  |
| A:             | $\frac{7}{2} \hat{k} \text{ Am}^2$                                                                                                                                                                                                                                                                                                                                                                                                 |
| B:             | $-\frac{7}{2} \hat{k} \text{ Am}^2$                                                                                                                                                                                                                                                                                                                                                                                                |
| C:             | $7 \hat{k} \text{ Am}^2$                                                                                                                                                                                                                                                                                                                                                                                                           |
| D:             | $-7 \hat{k} \text{ Am}^2$                                                                                                                                                                                                                                                                                                                                                                                                          |

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|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                                |
| Item No:       | 47                                                                                                                                                                                                                                                                                                                                                                                                               |
| Question ID:   | <b>1449647</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question:      | <p>A velocity selector consists of electric field <math>\vec{E} = E \hat{k}</math> and magnetic field <math>\vec{B} = B \hat{j}</math> with <math>B = 12\text{ mT}</math>. The value of <math>E</math> required for an electron of energy <math>728\text{ eV}</math> moving along the positive x-axis to pass undeflected is :</p> <p>(Given, mass of electron = <math>9.1 \times 10^{-31}\text{ kg}</math>)</p> |
| A:             | $192\text{ kVm}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                            |
| B:             | $192\text{ mVm}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                            |
| C:             | $9600\text{ kVm}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                           |
| D:             | $16\text{ kVm}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                             |

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| Topic:         | Physics-Section A |
| Item No:       | 48                |
| Question ID:   | <b>1449648</b>    |
| Question Type: | MCQ               |



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|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p>Two masses <math>M_1</math> and <math>M_2</math> are tied together at the two ends of a light inextensible string that passes over a frictionless pulley. When the mass <math>M_2</math> is twice that of <math>M_1</math>, the acceleration of the system is <math>a_1</math>. When the mass <math>M_2</math> is thrice that of <math>M_1</math>, the acceleration of the system is <math>a_2</math>. The ratio <math>\frac{a_1}{a_2}</math> will be :</p>  |
| A:        | $\frac{1}{3}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| B:        | $\frac{2}{3}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| C:        | $\frac{3}{2}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| D:        | $\frac{1}{2}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| Topic:         | Physics-Section A                                                                                   |
| Item No:       | 49                                                                                                  |
| Question ID:   | <b>1449649</b>                                                                                      |
| Question Type: | MCQ                                                                                                 |
| Question:      | Mass numbers of two nuclei are in the ratio of 4:3. Their nuclear densities will be in the ratio of |
| A:             | 4 : 3                                                                                               |
| B:             | $\left(\frac{3}{4}\right)^{\frac{1}{3}}$                                                            |
| C:             | 1 : 1                                                                                               |
| D:             | $\left(\frac{4}{3}\right)^{\frac{1}{3}}$                                                            |

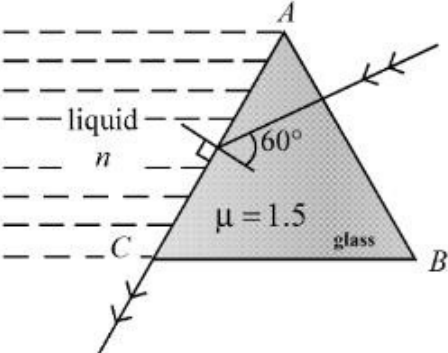
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| Topic:         | Physics-Section A |
| Item No:       | 50                |
| Question ID:   | <b>1449650</b>    |
| Question Type: | MCQ               |

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| Question: | The area of cross section of the rope used to lift a load by a crane is $2.5 \times 10^{-4} \text{ m}^2$ . The maximum lifting capacity of the crane is 10 metric tons. To increase the lifting capacity of the crane to 25 metric tons, the required area of cross section of the rope should be :<br>(take $g=10 \text{ ms}^{-2}$ ) |
| A:        | $6.25 \times 10^{-4} \text{ m}^2$                                                                                                                                                                                                                                                                                                     |
| B:        | $10 \times 10^{-4} \text{ m}^2$                                                                                                                                                                                                                                                                                                       |
| C:        | $1 \times 10^{-4} \text{ m}^2$                                                                                                                                                                                                                                                                                                        |
| D:        | $1.67 \times 10^{-4} \text{ m}^2$                                                                                                                                                                                                                                                                                                     |

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| Topic:         | Physics-Section B                                                                                                                                                                                           |
| Item No:       | 51                                                                                                                                                                                                          |
| Question ID:   | <b>1449651</b>                                                                                                                                                                                              |
| Question Type: | Numeric Answer                                                                                                                                                                                              |
| Question:      | If $\vec{A} = (2\hat{i} + 3\hat{j} - \hat{k}) \text{ m}$ and $\vec{B} = (\hat{i} + 2\hat{j} + 2\hat{k}) \text{ m}$ . The magnitude of component of vector $\vec{A}$ along vector $\vec{B}$ will be _____ m. |

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| Topic:         | Physics-Section B                                                                                                                                                                                                 |
| Item No:       | 52                                                                                                                                                                                                                |
| Question ID:   | <b>1449652</b>                                                                                                                                                                                                    |
| Question Type: | Numeric Answer                                                                                                                                                                                                    |
| Question:      | The radius of gyration of a cylindrical rod about an axis of rotation perpendicular to its length and passing through the center will be _____ m.<br><br>Given, the length of the rod is $10\sqrt{3} \text{ m}$ . |

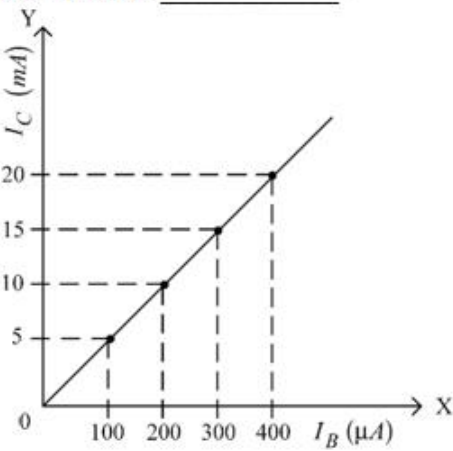
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| Topic:         | Physics-Section B |
| Item No:       | 53                |
| Question ID:   | <b>1449653</b>    |
| Question Type: | Numeric Answer    |

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| Question: | <p>In the given figure, the face <math>AC</math> of the equilateral prism is immersed in a liquid of refractive index '<math>n</math>'. For incident angle <math>60^\circ</math> at the side <math>AC</math>, the refracted light beam just grazes along face <math>AB</math>. The refractive index of the liquid <math>n = \frac{\sqrt{x}}{4}</math>.</p> <p>The value of <math>x</math> is _____.</p> <p>(Given refractive index of glass = 1.5)</p>  |
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| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                       |
| Item No:       | 54                                                                                                                                                                                                                                                                                                                      |
| Question ID:   | <b>1449654</b>                                                                                                                                                                                                                                                                                                          |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                          |
| Question:      | <p>Two lighter nuclei combine to form a comparatively heavier nucleus by the relation given below :</p> ${}_1^2X + {}_1^2X = {}_2^4Y$ <p>The binding energies per nucleon for <math>{}_1^2X</math> and <math>{}_2^4Y</math> are 1.1 MeV and 7.6 MeV respectively. The energy released in this process is _____ MeV.</p> |

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| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Item No:       | 55                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Question ID:   | <b>1449655</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Question:      | <p>A uniform heavy rod of mass 20 kg, cross sectional area <math>0.4 \text{ m}^2</math> and length 20 m is hanging from a fixed support. Neglecting the lateral contraction, the elongation in the rod due to its own weight is <math>x \times 10^{-9} \text{ m}</math>. The value of <math>x</math> is _____.</p> <p>(Given, young modulus <math>Y = 2 \times 10^{11} \text{ Nm}^{-2}</math> and <math>g = 10 \text{ ms}^{-2}</math>)</p> |

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| Topic:         | Physics-Section B |
| Item No:       | 56                |
| Question ID:   | <b>1449656</b>    |
| Question Type: | Numeric Answer    |

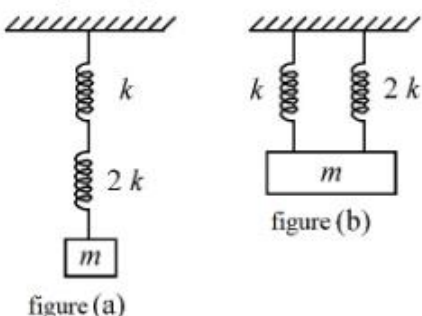
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| Question: | <p>The typical transfer characteristics of a transistor in CE configuration is shown in figure. A load resistor of <math>2\text{ k}\Omega</math> is connected in the collector branch of the circuit used. The input resistance of the transistor is <math>0.50\text{ k}\Omega</math>. The voltage gain of the transistor is _____.</p>  |
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| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Item No:       | 57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>1449657</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Question:      | <p>Three point charges of magnitude <math>5\mu\text{C}</math>, <math>0.16\mu\text{C}</math> and <math>0.3\mu\text{C}</math> are located at the vertices <math>A</math>, <math>B</math>, <math>C</math> of a right angled triangle whose sides are <math>AB = 3\text{ cm}</math>, <math>BC = 3\sqrt{2}\text{ cm}</math> and <math>CA = 3\text{ cm}</math> and point <math>A</math> is the right angle corner. Charge at point <math>A</math> experiences _____ N of electrostatic force due to the other two charges.</p> |

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| Topic:         | Physics-Section B                                                                                                                                                                                                                                                         |
| Item No:       | 58                                                                                                                                                                                                                                                                        |
| Question ID:   | <b>1449658</b>                                                                                                                                                                                                                                                            |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                            |
| Question:      | <p>In a coil of resistance <math>8\text{ }\Omega</math>, the magnetic flux due to an external magnetic field varies with time as <math>\phi = \frac{2}{3}(9 - t^2)</math>. The value of total heat produced in the coil, till the flux becomes zero, will be _____ J.</p> |

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| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Item No:       | 59                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Question ID:   | <b>1449659</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Question:      | <p>A potentiometer wire of length <math>300\text{ cm}</math> is connected in series with a resistance <math>780\text{ }\Omega</math> and a standard cell of emf <math>4\text{ V}</math>. A constant current flows through potentiometer wire. The length of the null point for cell of emf <math>20\text{ mV}</math> is found to be <math>60\text{ cm}</math>. The resistance of the potentiometer wire is _____ <math>\Omega</math>.</p> |

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| Topic: | Physics-Section B |
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|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| Item No:       | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Question ID:   | <b>1449660</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question:      | <p>As per given figures, two springs of spring constants <math>k</math> and <math>2k</math> are connected to mass <math>m</math>. If the period of oscillation in figure (a) is <math>3\text{ s}</math>, then the period of oscillation in figure (b) will be <math>\sqrt{x}\text{ s}</math>. The value of <math>x</math> is _____.</p>  <p>figure (a)                      figure (b)</p> |

|                |                                                                                                                                                                                                      |
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| Topic:         | Chemistry-Section A                                                                                                                                                                                  |
| Item No:       | 61                                                                                                                                                                                                   |
| Question ID:   | <b>1449661</b>                                                                                                                                                                                       |
| Question Type: | MCQ                                                                                                                                                                                                  |
| Question:      | <p>Hemoglobin contains 0.34% of iron by mass. The number of Fe atoms in 3.3 g of hemoglobin is<br/>(Given: Atomic mass of Fe is 56 u, <math>N_A = 6.022 \times 10^{23} \text{ mol}^{-1}</math>.)</p> |
| A:             | $1.21 \times 10^5$                                                                                                                                                                                   |
| B:             | $12.0 \times 10^{16}$                                                                                                                                                                                |
| C:             | $1.21 \times 10^{20}$                                                                                                                                                                                |
| D:             | $3.4 \times 10^{22}$                                                                                                                                                                                 |

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|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                      |
| Item No:       | 62                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>1449662</b>                                                                                                                                                                                                                                                                           |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                      |
| Question:      | <p>Arrange the following in increasing order of their covalent character.</p> <p>A. <math>\text{CaF}_2</math><br/> B. <math>\text{CaCl}_2</math><br/> C. <math>\text{CaBr}_2</math><br/> D. <math>\text{CaI}_2</math></p> <p>Choose the correct answer from the options given below.</p> |
| A:             | $B < A < C < D$                                                                                                                                                                                                                                                                          |
| B:             | $A < B < C < D$                                                                                                                                                                                                                                                                          |



|    |                 |
|----|-----------------|
| C: | $A < B < D < C$ |
| D: | $A < C < B < D$ |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Item No:       | 63                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>1449663</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Question:      | <p>Class XII students were asked to prepare one litre of buffer solution of pH 8.26 by their Chemistry teacher. The amount of ammonium chloride to be dissolved by the student in 0.2 M ammonia solution to make one litre of the buffer is<br/>           (Given: <math>pK_b(NH_3) = 4.74</math><br/>           Molar mass of <math>NH_3 = 17 \text{ g mol}^{-1}</math><br/>           Molar mass of <math>NH_4Cl = 53.5 \text{ g mol}^{-1}</math>)</p> |
| A:             | 53.5 g                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| B:             | 72.3 g                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| C:             | 107.0 g                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| D:             | 126.0 g                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                                                                  |
| Item No:       | 64                                                                                                                                                                                                                                                                                                                                   |
| Question ID:   | <b>1449664</b>                                                                                                                                                                                                                                                                                                                       |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                  |
| Question:      | <p>At <math>30^\circ\text{C}</math>, the half life for the decomposition of <math>AB_2</math> is 200 s and is independent of the initial concentration of <math>AB_2</math>. The time required for 80% of the <math>AB_2</math> to decompose is<br/>           Given: <math>\log 2 = 0.30</math><br/> <math>\log 3 = 0.48</math></p> |
| A:             | 200 s                                                                                                                                                                                                                                                                                                                                |
| B:             | 323 s                                                                                                                                                                                                                                                                                                                                |
| C:             | 467 s                                                                                                                                                                                                                                                                                                                                |
| D:             | 532 s                                                                                                                                                                                                                                                                                                                                |

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| Topic:         | Chemistry-Section A |
| Item No:       | 65                  |
| Question ID:   | <b>1449665</b>      |
| Question Type: | MCQ                 |



|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p>Given below are two statements: one is labelled as <b>Assertion A</b> and the other is labelled as <b>Reason R</b>.</p> <p><b>Assertion A:</b> Finest gold is red in colour, as the size of the particles increases, it appears purple then blue and finally gold.</p> <p><b>Reason R:</b> The colour of the colloidal solution depends on the wavelength of light scattered by the dispersed particles.</p> <p>In the light of the above statements, choose the <i>most appropriate</i> answer from the options given below.</p> |
| A:        | Both <b>A</b> and <b>R</b> are true and <b>R</b> is the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| B:        | Both <b>A</b> and <b>R</b> are true but <b>R</b> is NOT the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| C:        | <b>A</b> is true but <b>R</b> is false.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| D:        | <b>A</b> is false but <b>R</b> is true.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| Topic:         | Chemistry-Section A                                                                             |
| Item No:       | 66                                                                                              |
| Question ID:   | <b>1449666</b>                                                                                  |
| Question Type: | MCQ                                                                                             |
| Question:      | The metal that has very low melting point and its periodic position is closer to a metalloid is |
| A:             | Al                                                                                              |
| B:             | Ga                                                                                              |
| C:             | Se                                                                                              |
| D:             | In                                                                                              |

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| Topic:         | Chemistry-Section A                                     |
| Item No:       | 67                                                      |
| Question ID:   | <b>1449667</b>                                          |
| Question Type: | MCQ                                                     |
| Question:      | The metal that is not extracted from its sulfide ore is |
| A:             | Aluminium                                               |
| B:             | Iron                                                    |
| C:             | Lead                                                    |
| D:             | Zinc                                                    |

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| Topic:         | Chemistry-Section A |
| Item No:       | 68                  |
| Question ID:   | <b>1449668</b>      |
| Question Type: | MCQ                 |

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|-----------|-----------------------------------------------------------------------------------------------------|
| Question: | The products obtained from a reaction of hydrogen peroxide and acidified potassium permanganate are |
| A:        | $\text{Mn}^{4+}$ , $\text{H}_2\text{O}$ only                                                        |
| B:        | $\text{Mn}^{2+}$ , $\text{H}_2\text{O}$ only                                                        |
| C:        | $\text{Mn}^{4+}$ , $\text{H}_2\text{O}$ , $\text{O}_2$ only                                         |
| D:        | $\text{Mn}^{2+}$ , $\text{H}_2\text{O}$ , $\text{O}_2$ only                                         |

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|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Item No:       | 69                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Question ID:   | <b>1449669</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Question:      | <p>Given below are two statements: one is labelled as <b>Assertion A</b> and the other is labelled as <b>Reason R</b>.<br/> <b>Assertion A:</b> LiF is sparingly soluble in water.<br/> <b>Reason R:</b> The ionic radius of <math>\text{Li}^+</math> ion is smallest among its group members, hence has least hydration enthalpy.<br/> In the light of the above statements, choose the <i>most appropriate</i> answer from the options given below.</p> |
| A:             | Both <b>A</b> and <b>R</b> are true and <b>R</b> is the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                 |
| B:             | Both <b>A</b> and <b>R</b> are true but <b>R</b> is NOT the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                             |
| C:             | <b>A</b> is true but <b>R</b> is false.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| D:             | <b>A</b> is false but <b>R</b> is true.                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Item No:       | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question ID:   | <b>1449670</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Question:      | <p>Given below are two statements: one is labelled as <b>Assertion A</b> and the other is labelled as <b>Reason R</b>.<br/> <b>Assertion A:</b> Boric acid is a weak acid.<br/> <b>Reason R:</b> Boric acid is not able to release <math>\text{H}^+</math> ion on its own. It receives <math>\text{OH}^-</math> ion from water and releases <math>\text{H}^+</math> ion.<br/> In the light of the above statements, choose the <i>most appropriate</i> answer from the options given below.</p> |
| A:             | Both <b>A</b> and <b>R</b> are correct and <b>R</b> is the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                                                    |
| B:             | Both <b>A</b> and <b>R</b> are correct but <b>R</b> is NOT the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                                                |
| C:             | <b>A</b> is correct but <b>R</b> is not correct.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| D:             | <b>A</b> is not correct but <b>R</b> is correct.                                                                                                                                                                                                                                                                                                                                                                                                                                                |

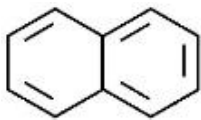
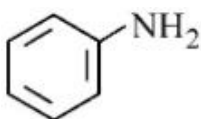
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| Topic: | Chemistry-Section A |
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| Item No:       | 71                                                                     |
| Question ID:   | <b>1449671</b>                                                         |
| Question Type: | MCQ                                                                    |
| Question:      | The metal complex that is diamagnetic is (Atomic number: Fe,26; Cu,29) |
| A:             | $K_3[Cu(CN)_4]$                                                        |
| B:             | $K_2[Cu(CN)_4]$                                                        |
| C:             | $K_3[Fe(CN)_4]$                                                        |
| D:             | $K_4[FeCl_6]$                                                          |

| Topic:                                                   | Chemistry-Section A                                                                                                                                                                                                                                                                                                                                                                                                      |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------|------------------|---------------|-------------------|-----------------|--------------------|---------------------|-----------------------|--------------------------|-------------|----------------------|--|
| Item No:                                                 | 72                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| Question ID:                                             | 1449672                                                                                                                                                                                                                                                                                                                                                                                                                  |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| Question Type:                                           | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                      |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| Question:                                                | Match <b>List I</b> with <b>List II</b> .                                                                                                                                                                                                                                                                                                                                                                                |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
|                                                          | <table><thead><tr><th><b>List I</b></th><th><b>List II</b></th></tr><tr><th><b>Pollutant</b></th><th><b>Source</b></th></tr></thead><tbody><tr><td>A. Microorganisms</td><td>I. Strip mining</td></tr><tr><td>B. Plant nutrients</td><td>II. Domestic sewage</td></tr><tr><td>C. Toxic heavy metals</td><td>III. Chemical fertilizer</td></tr><tr><td>D. Sediment</td><td>IV. Chemical factory</td></tr></tbody></table> | <b>List I</b>            | <b>List II</b> | <b>Pollutant</b> | <b>Source</b> | A. Microorganisms | I. Strip mining | B. Plant nutrients | II. Domestic sewage | C. Toxic heavy metals | III. Chemical fertilizer | D. Sediment | IV. Chemical factory |  |
|                                                          | <b>List I</b>                                                                                                                                                                                                                                                                                                                                                                                                            | <b>List II</b>           |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
|                                                          | <b>Pollutant</b>                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Source</b>            |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
|                                                          | A. Microorganisms                                                                                                                                                                                                                                                                                                                                                                                                        | I. Strip mining          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
|                                                          | B. Plant nutrients                                                                                                                                                                                                                                                                                                                                                                                                       | II. Domestic sewage      |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
|                                                          | C. Toxic heavy metals                                                                                                                                                                                                                                                                                                                                                                                                    | III. Chemical fertilizer |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| D. Sediment                                              | IV. Chemical factory                                                                                                                                                                                                                                                                                                                                                                                                     |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| Choose the correct answer from the options given below : |                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| A:                                                       | A-II, B-III, C-IV, D-I                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| B:                                                       | A-II, B-I, C-IV D-III                                                                                                                                                                                                                                                                                                                                                                                                    |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| C:                                                       | A-I, B-IV, C-II, D-III                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |
| D:                                                       | A-I, B-IV, C-III, D-II                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                |                  |               |                   |                 |                    |                     |                       |                          |             |                      |  |

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| Topic:         | Chemistry-Section A                                                                                                                |  |
| Item No:       | 73                                                                                                                                 |  |
| Question ID:   | <b>1449673</b>                                                                                                                     |  |
| Question Type: | MCQ                                                                                                                                |  |
| Question:      | The correct decreasing order of priority of functional groups in naming an organic compound as per IUPAC system of nomenclature is |  |
| A:             | $-\text{COOH} > -\text{CONH}_2 > -\text{COCl} > -\text{CHO}$                                                                       |  |
| B:             | $-\text{SO}_3\text{H} > -\text{COCl} > -\text{CONH}_2 > -\text{CN}$                                                                |  |
| C:             | $-\text{COOR} > -\text{COCl} > -\text{NH}_2 > \text{>C=O}$                                                                         |  |

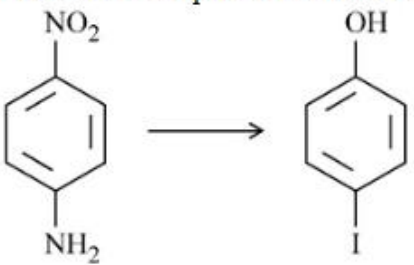
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| D: | $-\text{COOH} > -\text{COOR} > -\text{CONH}_2 > -\text{COCl}$ |
|----|---------------------------------------------------------------|

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|----------------|------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                |
| Item No:       | 74                                                                                 |
| Question ID:   | <b>1449674</b>                                                                     |
| Question Type: | MCQ                                                                                |
| Question:      | Which of the following is not an example of benzenoid compound?                    |
| A:             |   |
| B:             |   |
| C:             |   |
| D:             |  |

|                |                                                      |
|----------------|------------------------------------------------------|
| Topic:         | Chemistry-Section A                                  |
| Item No:       | 75                                                   |
| Question ID:   | <b>1449675</b>                                       |
| Question Type: | MCQ                                                  |
| Question:      | Hydrolysis of which compound will give carboic acid? |
| A:             | Cumene                                               |
| B:             | Benzenediazonium chloride                            |
| C:             | Benzal chloride                                      |
| D:             | Ethylene glycol ketal                                |

|                |                                                                                                                                                                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                                      |
| Item No:       | 76                                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>1449676</b>                                                                                                                                                                                                                                                                                           |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                      |
| Question:      | $\text{EtO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}_2\text{C}-\text{Cyclopentene}-\text{CH}_2\text{CH}_2\text{CN} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) DiBAL-H}} ?$ <p>[Et is <math>-\text{C}_2\text{H}_5</math>]<br/>Consider the above reaction and predict the major product.</p> |

|    |                                                                                                                                |
|----|--------------------------------------------------------------------------------------------------------------------------------|
| A: | $\text{OHC}-\text{H}_2\text{C}-\text{C}_5\text{H}_8-\text{CH}_2\text{CH}_2\text{CHO}$                                          |
| B: | $\text{EtO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}_2\text{C}-\text{C}_5\text{H}_8-\text{CH}_2\text{CH}_2\text{CHO}$  |
| C: | $\text{EtO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}_2\text{C}-\text{C}_5\text{H}_8-\text{CH}_2\text{CH}_2\text{COOH}$ |
| D: | $\text{OHC}-\text{H}_2\text{C}-\text{C}_5\text{H}_8-\text{CH}_2\text{CH}_2\text{COOH}$                                         |

|                |                                                                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                              |
| Item No:       | 77                                                                                                                                                               |
| Question ID:   | 1449677                                                                                                                                                          |
| Question Type: | MCQ                                                                                                                                                              |
| Question:      | <p>The correct sequential order of the reagents for the given reaction is</p>  |
| A:             | $\text{HNO}_2, \text{Fe}/\text{H}^+, \text{HNO}_2, \text{KI}, \text{H}_2\text{O}/\text{H}^+$                                                                     |
| B:             | $\text{HNO}_2, \text{KI}, \text{Fe}/\text{H}^+, \text{HNO}_2, \text{H}_2\text{O}/\text{warm}$                                                                    |
| C:             | $\text{HNO}_2, \text{KI}, \text{HNO}_2, \text{Fe}/\text{H}^+, \text{H}_2\text{O}/\text{H}^+$                                                                     |
| D:             | $\text{HNO}_2, \text{Fe}/\text{H}^+, \text{KI}, \text{HNO}_2, \text{H}_2\text{O}/\text{warm}$                                                                    |

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|----------------|----------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                            |
| Item No:       | 78                                                             |
| Question ID:   | 1449678                                                        |
| Question Type: | MCQ                                                            |
| Question:      | Vulcanization of rubber is carried out by heating a mixture of |
| A:             | isoprene and styrene                                           |
| B:             | neoprene and sulphur                                           |
| C:             | isoprene and sulphur                                           |
| D:             | neoprene and styrene                                           |

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| Topic: | Chemistry-Section A |
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| Item No:       | 79                                 |
| Question ID:   | <b>1449679</b>                     |
| Question Type: | MCQ                                |
| Question:      | Animal starch is the other name of |
| A:             | amylose.                           |
| B:             | maltose.                           |
| C:             | glycogen.                          |
| D:             | amylopectin.                       |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Item No:       | 80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Question ID:   | <b>1449680</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Question:      | <p>Given below are two statements: one is labelled as <b>Assertion A</b> and the other is labelled as <b>Reason R</b>.<br/> <b>Assertion A:</b> Phenolphthalein is a pH dependent indicator, remains colourless in acidic solution and gives pink colour in basic medium.<br/> <b>Reason R:</b> Phenolphthalein is a weak acid. It doesn't dissociate in basic medium.<br/> In the light of the above statements, choose the <i>most appropriate</i> answer from the options given below.</p> |
| A:             | Both <b>A</b> and <b>R</b> are true and <b>R</b> is the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                                                     |
| B:             | Both <b>A</b> and <b>R</b> are true but <b>R</b> is NOT the correct explanation of <b>A</b> .                                                                                                                                                                                                                                                                                                                                                                                                 |
| C:             | <b>A</b> is true but <b>R</b> is false.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| D:             | <b>A</b> is false but <b>R</b> is true.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                |                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                                             |
| Item No:       | 81                                                                                                                                                                                                                                                                                                                                                              |
| Question ID:   | <b>1449681</b>                                                                                                                                                                                                                                                                                                                                                  |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                  |
| Question:      | <p>A 10 g mixture of hydrogen and helium is contained in a vessel of capacity <math>0.0125 \text{ m}^3</math> at 6 bar and <math>27^\circ\text{C}</math>. The mass of helium in the mixture is _____ g. (nearest integer)<br/> Given: <math>R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}</math><br/> (Atomic masses of H and He are 1 u and 4 u, respectively)</p> |

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| Topic:         | Chemistry-Section B |
| Item No:       | 82                  |
| Question ID:   | <b>1449682</b>      |
| Question Type: | Numeric Answer      |



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| Question: | Consider an imaginary ion ${}^{48}_{22}\text{X}^{3-}$ . The nucleus contains 'a' % more neutrons than the number of electrons in the ion. The value of 'a' is _____. [nearest integer] |
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| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                      |
| Item No:       | 83                                                                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>1449683</b>                                                                                                                                                                                                                                                                                                                           |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                           |
| Question:      | For the reaction<br>$\text{H}_2\text{F}_2(\text{g}) \rightarrow \text{H}_2(\text{g}) + \text{F}_2(\text{g})$<br>$\Delta U = -59.6 \text{ kJ mol}^{-1}$ at $27^\circ\text{C}$ .<br>The enthalpy change for the above reaction is (-) _____ $\text{kJ mol}^{-1}$ [nearest integer]<br>Given: $R = 8.314 \text{ J K}^{-1}\text{mol}^{-1}$ . |

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| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                   |
| Item No:       | 84                                                                                                                                                                                                                                                                    |
| Question ID:   | <b>1449684</b>                                                                                                                                                                                                                                                        |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                        |
| Question:      | The elevation in boiling point for 1 molal solution of non-volatile solute A is 3 K. The depression in freezing point for 2 molal solution of A in the same solvent is 6 K. The ratio of $K_b$ and $K_f$ i.e., $K_b/K_f$ is 1: X. The value of X is [nearest integer] |

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| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Item No:       | 85                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question ID:   | <b>1449685</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Question:      | 20 mL of 0.02 M hypo solution is used for the titration of 10 mL of copper sulphate solution, in the presence of excess of KI using starch as an indicator. The molarity of $\text{Cu}^{2+}$ is found to be _____ $\times 10^{-2} \text{ M}$ . [nearest integer]<br>Given : $2 \text{Cu}^{2+} + 4 \text{I}^- \rightarrow \text{Cu}_2\text{I}_2 + \text{I}_2$<br>$\text{I}_2 + 2 \text{S}_2\text{O}_3^{2-} \rightarrow 2 \text{I}^- + \text{S}_4\text{O}_6^{2-}$ |

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| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                   |
| Item No:       | 86                                                                                                                                                                                                                                                                    |
| Question ID:   | <b>1449686</b>                                                                                                                                                                                                                                                        |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                        |
| Question:      | The number of non-ionisable protons present in the product B obtained from the following reactions is _____.<br>$\text{C}_2\text{H}_5\text{OH} + \text{PCl}_3 \rightarrow \text{C}_2\text{H}_5\text{Cl} + \text{A}$<br>$\text{A} + \text{PCl}_3 \rightarrow \text{B}$ |

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| Topic:         | Chemistry-Section B                                                                                                                                                           |
| Item No:       | 87                                                                                                                                                                            |
| Question ID:   | <b>1449687</b>                                                                                                                                                                |
| Question Type: | Numeric Answer                                                                                                                                                                |
| Question:      | The spin-only magnetic moment value of the compound with strongest oxidizing ability among $\text{MnF}_4$ , $\text{MnF}_3$ and $\text{MnF}_2$ is _____ B.M. [nearest integer] |

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| Topic:         | Chemistry-Section B                                                                                           |
| Item No:       | 88                                                                                                            |
| Question ID:   | <b>1449688</b>                                                                                                |
| Question Type: | Numeric Answer                                                                                                |
| Question:      | Total number of isomers (including stereoisomers) obtained on monochlorination of methylcyclohexane is _____. |

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| Topic:         | Chemistry-Section B                                                                                                                                                             |
| Item No:       | 89                                                                                                                                                                              |
| Question ID:   | <b>1449689</b>                                                                                                                                                                  |
| Question Type: | Numeric Answer                                                                                                                                                                  |
| Question:      | A 100 mL solution of $\text{CH}_3\text{CH}_2\text{MgBr}$ on treatment with methanol produces 2.24 mL of a gas at STP. The weight of gas produced is _____ mg. [nearest integer] |

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| Topic:         | Chemistry-Section B                                                                                                                 |
| Item No:       | 90                                                                                                                                  |
| Question ID:   | <b>1449690</b>                                                                                                                      |
| Question Type: | Numeric Answer                                                                                                                      |
| Question:      | How many of the following drugs is/are example(s) of broad spectrum antibiotics ?<br>Ofloxacin, Penicillin G, Terpineol, Salvarsan. |