

|             |              |
|-------------|--------------|
| Paper:      | B.E_B.Tech   |
| Set Name:   | Item25       |
| Exam Date:  | 29 July 2022 |
| Exam Shift: | 1            |
| Languange:  | English      |

|                |                                                                                                                                                                                                        |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                  |
| Item No:       | 1                                                                                                                                                                                                      |
| Question ID:   | <b>100201</b>                                                                                                                                                                                          |
| Question Type: | MCQ                                                                                                                                                                                                    |
| Question:      | Let R be a relation from the set $\{1, 2, 3, \dots, 60\}$ to itself such that $R = \{(a, b) : b = pq, \text{ where } p, q \geq 3 \text{ are prime numbers}\}$ . Then, the number of elements in R is : |
| A:             | 600                                                                                                                                                                                                    |
| B:             | 660                                                                                                                                                                                                    |
| C:             | 540                                                                                                                                                                                                    |
| D:             | 720                                                                                                                                                                                                    |

|                |                                                          |
|----------------|----------------------------------------------------------|
| Topic:         | Mathematics-Section A                                    |
| Item No:       | 2                                                        |
| Question ID:   | <b>100202</b>                                            |
| Question Type: | MCQ                                                      |
| Question:      | If $z = 2 + 3i$ , then $z^5 + (\bar{z})^5$ is equal to : |
| A:             | 244                                                      |
| B:             | 224                                                      |
| C:             | 245                                                      |
| D:             | 265                                                      |

|                |                       |
|----------------|-----------------------|
| Topic:         | Mathematics-Section A |
| Item No:       | 3                     |
| Question ID:   | <b>100203</b>         |
| Question Type: | MCQ                   |



|           |                                                                                            |
|-----------|--------------------------------------------------------------------------------------------|
| Question: | Let A and B be two $3 \times 3$ non-zero real matrices such that AB is a zero matrix. Then |
| A:        | the system of linear equations $AX=0$ has a unique solution                                |
| B:        | the system of linear equations $AX=0$ has infinitely many solutions                        |
| C:        | B is an invertible matrix                                                                  |
| D:        | $\text{adj}(A)$ is an invertible matrix                                                    |

|                |                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                      |
| Item No:       | 4                                                                                                                                          |
| Question ID:   | <b>100204</b>                                                                                                                              |
| Question Type: | MCQ                                                                                                                                        |
| Question:      | If $\frac{1}{(20-a)(40-a)} + \frac{1}{(40-a)(60-a)} + \dots + \frac{1}{(180-a)(200-a)} = \frac{1}{256}$ , then the maximum value of a is : |
| A:             | 198                                                                                                                                        |
| B:             | 202                                                                                                                                        |
| C:             | 212                                                                                                                                        |
| D:             | 218                                                                                                                                        |

|                |                                                                                                                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                       |
| Item No:       | 5                                                                                                                                                                                                           |
| Question ID:   | <b>100205</b>                                                                                                                                                                                               |
| Question Type: | MCQ                                                                                                                                                                                                         |
| Question:      | If $\lim_{x \rightarrow 0} \frac{\alpha e^x + \beta e^{-x} + \gamma \sin x}{x \sin^2 x} = \frac{2}{3}$ , where $\alpha, \beta, \gamma \in \mathbf{R}$ , then which of the following is <b>NOT</b> correct ? |
| A:             | $\alpha^2 + \beta^2 + \gamma^2 = 6$                                                                                                                                                                         |
| B:             | $\alpha\beta + \beta\gamma + \gamma\alpha + 1 = 0$                                                                                                                                                          |
| C:             | $\alpha\beta^2 + \beta\gamma^2 + \gamma\alpha^2 + 3 = 0$                                                                                                                                                    |



|    |                                     |
|----|-------------------------------------|
| D: | $\alpha^2 - \beta^2 + \gamma^2 = 4$ |
|----|-------------------------------------|

|                |                                                                                           |
|----------------|-------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                     |
| Item No:       | 6                                                                                         |
| Question ID:   | 100206                                                                                    |
| Question Type: | MCQ                                                                                       |
| Question:      | The integral $\int_0^{\frac{\pi}{2}} \frac{1}{3 + 2 \sin x + \cos x} \, dx$ is equal to : |
| A:             | $\tan^{-1}(2)$                                                                            |
| B:             | $\tan^{-1}(2) - \frac{\pi}{4}$                                                            |
| C:             | $\frac{1}{2}\tan^{-1}(2) - \frac{\pi}{8}$                                                 |
| D:             | $\frac{1}{2}$                                                                             |

|                |                                                                                                                                                                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                                                        |
| Item No:       | 7                                                                                                                                                                                                                                            |
| Question ID:   | 100207                                                                                                                                                                                                                                       |
| Question Type: | MCQ                                                                                                                                                                                                                                          |
| Question:      | Let the solution curve $y=y(x)$ of the differential equation $\left(1 + e^{2x}\right)\left(\frac{dy}{dx} + y\right) = 1$ pass through the point $\left(0, \frac{\pi}{2}\right)$ . Then, $\lim_{x \rightarrow \infty} e^x y(x)$ is equal to : |
| A:             | $\frac{\pi}{4}$                                                                                                                                                                                                                              |
| B:             | $\frac{3\pi}{4}$                                                                                                                                                                                                                             |



|    |                  |
|----|------------------|
| C: | $\frac{\pi}{2}$  |
| D: | $\frac{3\pi}{2}$ |

|                |                                                                                                                                                                                                                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                                                                                      |
| Item No:       | 8                                                                                                                                                                                                                                                                                                                                          |
| Question ID:   | 100208                                                                                                                                                                                                                                                                                                                                     |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                        |
| Question:      | Let a line L pass through the point of intersection of the lines $bx + 10y - 8 = 0$ and $2x - 3y = 0$ , $b \in \mathbf{R} - \left\{\frac{4}{3}\right\}$ . If the line L also passes through the point (1, 1) and touches the circle $17(x^2 + y^2) = 16$ , then the eccentricity of the ellipse $\frac{x^2}{5} + \frac{y^2}{b^2} = 1$ is : |
| A:             | $\frac{2}{\sqrt{5}}$                                                                                                                                                                                                                                                                                                                       |
| B:             | $\sqrt{\frac{3}{5}}$                                                                                                                                                                                                                                                                                                                       |
| C:             | $\frac{1}{\sqrt{5}}$                                                                                                                                                                                                                                                                                                                       |
| D:             | $\sqrt{\frac{2}{5}}$                                                                                                                                                                                                                                                                                                                       |

|                |                       |
|----------------|-----------------------|
| Topic:         | Mathematics-Section A |
| Item No:       | 9                     |
| Question ID:   | 100209                |
| Question Type: | MCQ                   |



|           |                                                                                                                                                                                                                                                                               |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | If the foot of the perpendicular from the point A(−1, 4, 3) on the plane P : 2x + my + nz = 4, is $\left(-2, \frac{7}{2}, \frac{3}{2}\right)$ , then the distance of the point A from the plane P, measured parallel to a line with direction ratios 3, −1, −4, is equal to : |
| A:        | 1                                                                                                                                                                                                                                                                             |
| B:        | $\sqrt{26}$                                                                                                                                                                                                                                                                   |
| C:        | $2\sqrt{2}$                                                                                                                                                                                                                                                                   |
| D:        | $\sqrt{14}$                                                                                                                                                                                                                                                                   |

|                |                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                        |
| Item No:       | 10                                                                                                                                                                                                                                                                           |
| Question ID:   | 100210                                                                                                                                                                                                                                                                       |
| Question Type: | MCQ                                                                                                                                                                                                                                                                          |
| Question:      | Let $\vec{a} = 3\hat{i} + \hat{j}$ and $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ . Let $\vec{c}$ be a vector satisfying $\vec{a} \times (\vec{b} \times \vec{c}) = \vec{b} + \lambda \vec{c}$ . If $\vec{b}$ and $\vec{c}$ are non-parallel, then the value of $\lambda$ is : |
| A:             | −5                                                                                                                                                                                                                                                                           |
| B:             | 5                                                                                                                                                                                                                                                                            |
| C:             | 1                                                                                                                                                                                                                                                                            |
| D:             | −1                                                                                                                                                                                                                                                                           |

|                |                                                                                                                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                                          |
| Item No:       | 11                                                                                                                                                                                                                                                                                             |
| Question ID:   | 100211                                                                                                                                                                                                                                                                                         |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                            |
| Question:      | The angle of elevation of the top of a tower from a point A due north of it is $\alpha$ and from a point B at a distance of 9 units due west of A is $\cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$ . If the distance of the point B from the tower is 15 units, then $\cot \alpha$ is equal to : |



|    |               |
|----|---------------|
| A: | $\frac{6}{5}$ |
| B: | $\frac{9}{5}$ |
| C: | $\frac{4}{3}$ |
| D: | $\frac{7}{3}$ |

|                |                                                                          |
|----------------|--------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                    |
| Item No:       | 12                                                                       |
| Question ID:   | <b>100212</b>                                                            |
| Question Type: | MCQ                                                                      |
| Question:      | The statement $(p \wedge q) \Rightarrow (p \wedge r)$ is equivalent to : |
| A:             | $q \Rightarrow (p \wedge r)$                                             |
| B:             | $p \Rightarrow (p \wedge r)$                                             |
| C:             | $(p \wedge r) \Rightarrow (p \wedge q)$                                  |
| D:             | $(p \wedge q) \Rightarrow r$                                             |

|                |                                                                                                                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                     |
| Item No:       | 13                                                                                                                                                                                                        |
| Question ID:   | <b>100213</b>                                                                                                                                                                                             |
| Question Type: | MCQ                                                                                                                                                                                                       |
| Question:      | Let the circumcentre of a triangle with vertices A(a, 3), B(b, 5) and C(a, b), $ab > 0$ be P(1, 1). If the line AP intersects the line BC at the point Q( $k_1$ , $k_2$ ), then $k_1 + k_2$ is equal to : |
| A:             | 2                                                                                                                                                                                                         |
| B:             | $\frac{4}{7}$                                                                                                                                                                                             |



|    |               |
|----|---------------|
| C: | $\frac{2}{7}$ |
| D: | 4             |

|                |                                                                                                                                                                                                                                                                                      |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                                |
| Item No:       | 14                                                                                                                                                                                                                                                                                   |
| Question ID:   | 100214                                                                                                                                                                                                                                                                               |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                  |
| Question:      | Let $\hat{a}$ and $\hat{b}$ be two unit vectors such that the angle between them is $\frac{\pi}{4}$ . If $\theta$ is the angle between the vectors $(\hat{a} + \hat{b})$ and $(\hat{a} + 2\hat{b} + 2(\hat{a} \times \hat{b}))$ , then the value of $164 \cos^2\theta$ is equal to : |
| A:             | $90 + 27\sqrt{2}$                                                                                                                                                                                                                                                                    |
| B:             | $45 + 18\sqrt{2}$                                                                                                                                                                                                                                                                    |
| C:             | $90 + 3\sqrt{2}$                                                                                                                                                                                                                                                                     |
| D:             | $54 + 90\sqrt{2}$                                                                                                                                                                                                                                                                    |

|                |                                                                                                                   |
|----------------|-------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                             |
| Item No:       | 15                                                                                                                |
| Question ID:   | 100215                                                                                                            |
| Question Type: | MCQ                                                                                                               |
| Question:      | If $f(\alpha) = \int_1^\alpha \frac{\log_{10} t}{1 + t} dt, \alpha > 0$ , then $f(e^3) + f(e^{-3})$ is equal to : |
| A:             | 9                                                                                                                 |
| B:             | $\frac{9}{2}$                                                                                                     |
| C:             | $\frac{9}{\log_e (10)}$                                                                                           |



|    |                          |
|----|--------------------------|
| D: | $\frac{9}{2 \log_e(10)}$ |
|----|--------------------------|

|                |                                                                                       |
|----------------|---------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                 |
| Item No:       | 16                                                                                    |
| Question ID:   | 100216                                                                                |
| Question Type: | MCQ                                                                                   |
| Question:      | The area of the region $\{(x, y):  x - 1  \leq y \leq \sqrt{5 - x^2}\}$ is equal to : |
| A:             | $\frac{5}{2} \sin^{-1}\left(\frac{3}{5}\right) - \frac{1}{2}$                         |
| B:             | $\frac{5\pi}{4} - \frac{3}{2}$                                                        |
| C:             | $\frac{3\pi}{4} + \frac{3}{2}$                                                        |
| D:             | $\frac{5\pi}{4} - \frac{1}{2}$                                                        |

|                |                                                                                                                                                                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                                                                                                                                                                       |
| Item No:       | 17                                                                                                                                                                                                                                                                                                                          |
| Question ID:   | 100217                                                                                                                                                                                                                                                                                                                      |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                         |
| Question:      | Let the focal chord of the parabola P : $y^2=4x$ along the line L : $y = mx + c$ , $m > 0$ meet the parabola at the points M and N. Let the line L be a tangent to the hyperbola H : $x^2 - y^2 = 4$ . If O is the vertex of P and F is the focus of H on the positive x-axis, then the area of the quadrilateral OMFN is : |
| A:             | $2\sqrt{6}$                                                                                                                                                                                                                                                                                                                 |
| B:             | $2\sqrt{14}$                                                                                                                                                                                                                                                                                                                |
| C:             | $4\sqrt{6}$                                                                                                                                                                                                                                                                                                                 |



|    |              |
|----|--------------|
| D: | $4\sqrt{14}$ |
|----|--------------|

|                |                                                                                                                                                                               |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                                         |
| Item No:       | 18                                                                                                                                                                            |
| Question ID:   | <b>100218</b>                                                                                                                                                                 |
| Question Type: | MCQ                                                                                                                                                                           |
| Question:      | The number of points, where the function $f: \mathbf{R} \rightarrow \mathbf{R}$ ,<br>$f(x) =  x-1 \cos x-2  \sin x-1  + (x-3) x^2-5x+4 $ , is <b>NOT</b> differentiable, is : |
| A:             | 1                                                                                                                                                                             |
| B:             | 2                                                                                                                                                                             |
| C:             | 3                                                                                                                                                                             |
| D:             | 4                                                                                                                                                                             |

|                |                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section A                                                                                                                                    |
| Item No:       | 19                                                                                                                                                       |
| Question ID:   | <b>100219</b>                                                                                                                                            |
| Question Type: | MCQ                                                                                                                                                      |
| Question:      | Let $S = \{1, 2, 3, \dots, 2022\}$ . Then the probability, that a randomly chosen number $n$ from the set $S$ such that $\text{HCF}(n, 2022) = 1$ , is : |
| A:             | $\frac{128}{1011}$                                                                                                                                       |
| B:             | $\frac{166}{1011}$                                                                                                                                       |
| C:             | $\frac{127}{337}$                                                                                                                                        |
| D:             | $\frac{112}{337}$                                                                                                                                        |

|              |                       |
|--------------|-----------------------|
| Topic:       | Mathematics-Section A |
| Item No:     | 20                    |
| Question ID: | <b>100220</b>         |



|                |                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                    |
| Question:      | <p>Let <math>f(x) = 3(x^2 - 2)^3 + 4</math>, <math>x \in \mathbf{R}</math>. Then which of the following statements are true ?</p> <p>P : <math>x = 0</math> is a point of local minima of <math>f</math></p> <p>Q : <math>x = \sqrt{2}</math> is a point of inflection of <math>f</math></p> <p>R : <math>f'</math> is increasing for <math>x &gt; \sqrt{2}</math></p> |
| A:             | Only P and Q                                                                                                                                                                                                                                                                                                                                                           |
| B:             | Only P and R                                                                                                                                                                                                                                                                                                                                                           |
| C:             | Only Q and R                                                                                                                                                                                                                                                                                                                                                           |
| D:             | All P, Q and R                                                                                                                                                                                                                                                                                                                                                         |

|                |                                                                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                                                                                                               |
| Item No:       | 21                                                                                                                                                                                                                                  |
| Question ID:   | <b>100221</b>                                                                                                                                                                                                                       |
| Question Type: | Numeric Answer                                                                                                                                                                                                                      |
| Question:      | Let $S = \{\theta \in (0, 2\pi) : 7 \cos^2\theta - 3 \sin^2\theta - 2 \cos^2 2\theta = 2\}$ . Then, the sum of roots of all the equations $x^2 - 2(\tan^2\theta + \cot^2\theta)x + 6 \sin^2\theta = 0$ , $\theta \in S$ , is _____. |

|                |                                                                                                                                                                                                                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                                           |
| Item No:       | 22                                                                                                                                                                                                                                                                                              |
| Question ID:   | <b>100222</b>                                                                                                                                                                                                                                                                                   |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                  |
| Question:      | Let the mean and the variance of 20 observations $x_1, x_2, \dots, x_{20}$ be 15 and 9, respectively. For $\alpha \in \mathbf{R}$ , if the mean of $(x_1 + \alpha)^2, (x_2 + \alpha)^2, \dots, (x_{20} + \alpha)^2$ is 178, then the square of the maximum value of $\alpha$ is equal to _____. |

|                |                       |
|----------------|-----------------------|
| Topic:         | Mathematics-Section B |
| Item No:       | 23                    |
| Question ID:   | <b>100223</b>         |
| Question Type: | Numeric Answer        |



|           |                                                                                                                                                                                                                                                                                                                                            |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | Let a line with direction ratios $a, -4a, -7$ be perpendicular to the lines with direction ratios $3, -1, 2b$ and $b, a, -2$ . If the point of intersection of the line $\frac{x+1}{a^2+b^2} = \frac{y-2}{a^2-b^2} = \frac{z}{1}$ and the plane $x-y+z=0$ is $(\alpha, \beta, \gamma)$ , then $\alpha + \beta + \gamma$ is equal to _____. |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                |                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                               |
| Item No:       | 24                                                                                                                  |
| Question ID:   | <b>100224</b>                                                                                                       |
| Question Type: | Numeric Answer                                                                                                      |
| Question:      | Let $a_1, a_2, a_3, \dots$ be an A.P. If $\sum_{r=1}^{\infty} \frac{a_r}{2^r} = 4$ , then $4a_2$ is equal to _____. |

|                |                                                                                                                                                                                                                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                                                                                                    |
| Item No:       | 25                                                                                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>100225</b>                                                                                                                                                                                                                                                                                                                                            |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                           |
| Question:      | Let the ratio of the fifth term from the beginning to the fifth term from the end in the binomial expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ , in the increasing powers of $\frac{1}{\sqrt[4]{3}}$ be $\sqrt[4]{6} : 1$ . If the sixth term from the beginning is $\frac{\alpha}{\sqrt[4]{3}}$ , then $\alpha$ is equal to _____. |

|                |                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                      |
| Item No:       | 26                                                                                                                                         |
| Question ID:   | <b>100226</b>                                                                                                                              |
| Question Type: | Numeric Answer                                                                                                                             |
| Question:      | The number of matrices of order $3 \times 3$ , whose entries are either 0 or 1 and the sum of all the entries is a prime number, is _____. |

|              |                       |
|--------------|-----------------------|
| Topic:       | Mathematics-Section B |
| Item No:     | 27                    |
| Question ID: | <b>100227</b>         |



|                |                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                |
| Question:      | <p>Let <math>p</math> and <math>p + 2</math> be prime numbers and let</p> $\Delta = \begin{vmatrix} p! & (p + 1)! & (p + 2)! \\ (p + 1)! & (p + 2)! & (p + 3)! \\ (p + 2)! & (p + 3)! & (p + 4)! \end{vmatrix}$ <p>Then the sum of the maximum values of <math>\alpha</math> and <math>\beta</math>, such that <math>p^\alpha</math> and <math>(p + 2)^\beta</math> divide <math>\Delta</math>, is _____.</p> |

|                |                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                                                                                                        |
| Item No:       | 28                                                                                                                                                                                                                           |
| Question ID:   | <b>100228</b>                                                                                                                                                                                                                |
| Question Type: | Numeric Answer                                                                                                                                                                                                               |
| Question:      | <p>If <math>\frac{1}{2 \times 3 \times 4} + \frac{1}{3 \times 4 \times 5} + \frac{1}{4 \times 5 \times 6} + \dots + \frac{1}{100 \times 101 \times 102} = \frac{k}{101}</math>, then <math>34k</math> is equal to _____.</p> |

|                |                                                                                                                                                                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                           |
| Item No:       | 29                                                                                                                                                                                                                                                                              |
| Question ID:   | <b>100229</b>                                                                                                                                                                                                                                                                   |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                  |
| Question:      | <p>Let <math>S = \{4, 6, 9\}</math> and <math>T = \{9, 10, 11, \dots, 1000\}</math>. If <math>A = \{a_1 + a_2 + \dots + a_k : k \in \mathbf{N}, a_1, a_2, a_3, \dots, a_k \in S\}</math>, then the sum of all the elements in the set <math>T - A</math> is equal to _____.</p> |

|                |                                                                                                                                                                                                                                                                                                     |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Mathematics-Section B                                                                                                                                                                                                                                                                               |
| Item No:       | 30                                                                                                                                                                                                                                                                                                  |
| Question ID:   | <b>100230</b>                                                                                                                                                                                                                                                                                       |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                      |
| Question:      | <p>Let the mirror image of a circle <math>c_1 : x^2 + y^2 - 2x - 6y + \alpha = 0</math> in line <math>y = x + 1</math> be <math>c_2 : 5x^2 + 5y^2 + 10gx + 10fy + 38 = 0</math>. If <math>r</math> is the radius of circle <math>c_2</math>, then <math>\alpha + 6r^2</math> is equal to _____.</p> |

|          |                   |
|----------|-------------------|
| Topic:   | Physics-Section A |
| Item No: | 31                |



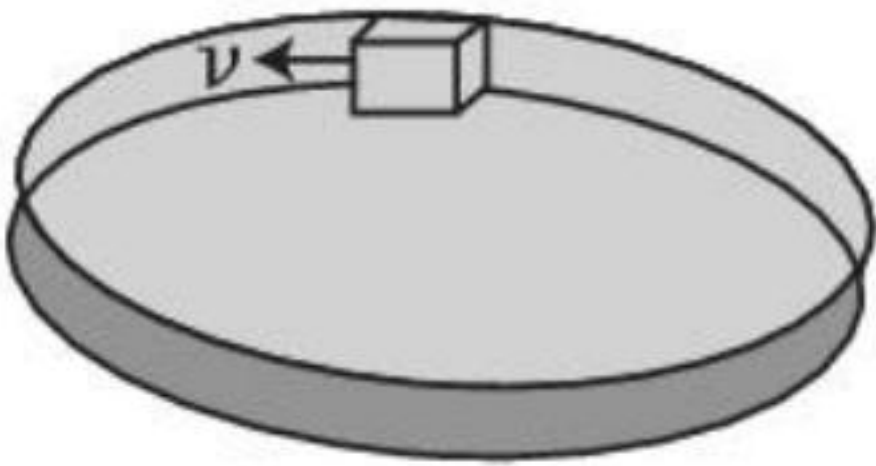
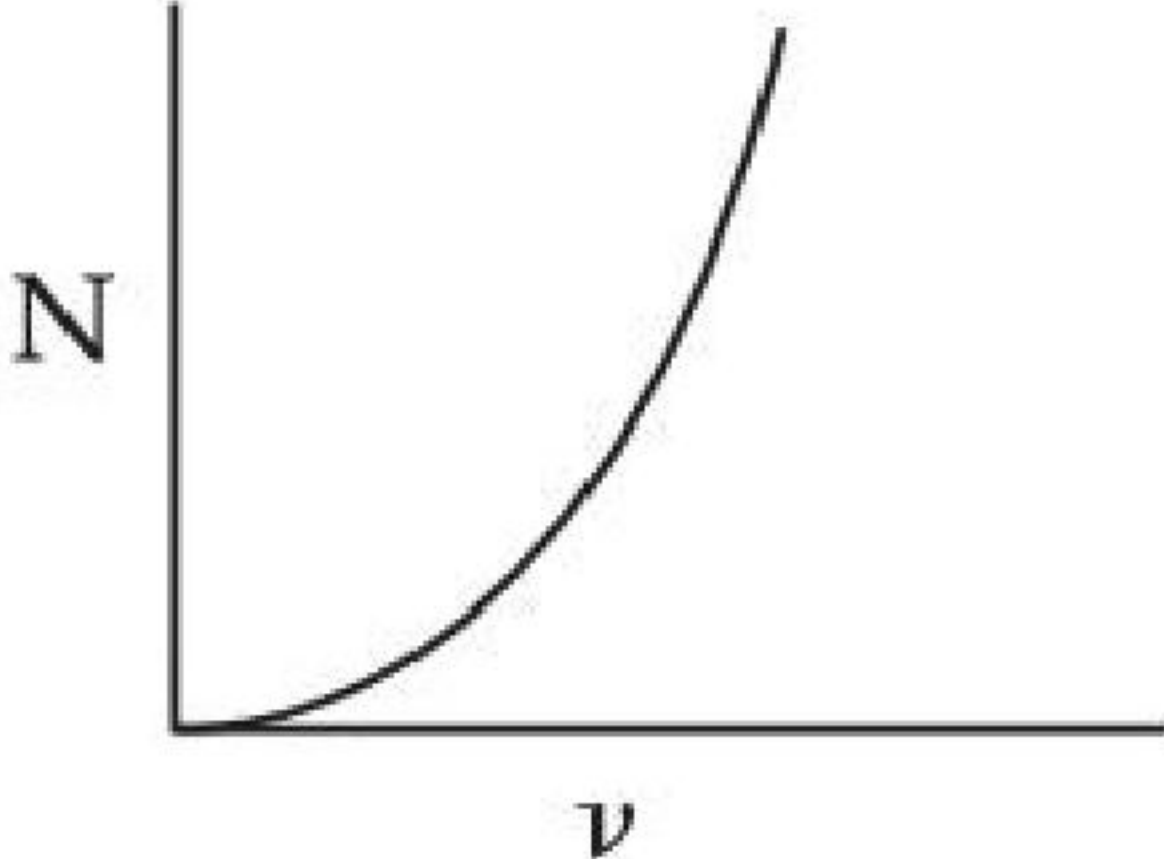
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question ID:   | 100231                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Question:      | <p>Given below are two statements : One is labelled as <b>Assertion (A)</b> and other is labelled as <b>Reason (R)</b>.</p> <p><b>Assertion (A) :</b> Time period of oscillation of a liquid drop depends on surface tension (S), if density of the liquid is <math>\rho</math> and radius of the drop is <math>r</math>, then <math>T = K \sqrt{\frac{\rho r^3}{S^{3/2}}}</math> is dimensionally correct, where K is dimensionless.</p> <p><b>Reason (R) :</b> Using dimensional analysis we get R.H.S. having different dimension than that of time period.</p> <p>In the light of above statements, choose the correct answer from the options given below.</p> |
| A:             | Both (A) and (R) are true and (R) is the correct explanation of (A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| B:             | Both (A) and (R) are true but (R) is not the correct explanation of (A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| C:             | (A) is true but (R) is false                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| D:             | (A) is false but (R) is true                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                |                                                                                                                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                                    |
| Item No:       | 32                                                                                                                                                                                                                                                   |
| Question ID:   | 100232                                                                                                                                                                                                                                               |
| Question Type: | MCQ                                                                                                                                                                                                                                                  |
| Question:      | <p>A ball is thrown up vertically with a certain velocity so that, it reaches a maximum height <math>h</math>.</p> <p>Find the ratio of the times in which it is at height <math>\frac{h}{3}</math> while going up and coming down respectively.</p> |
| A:             | $\frac{\sqrt{2} - 1}{\sqrt{2} + 1}$                                                                                                                                                                                                                  |
| B:             | $\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$                                                                                                                                                                                                    |

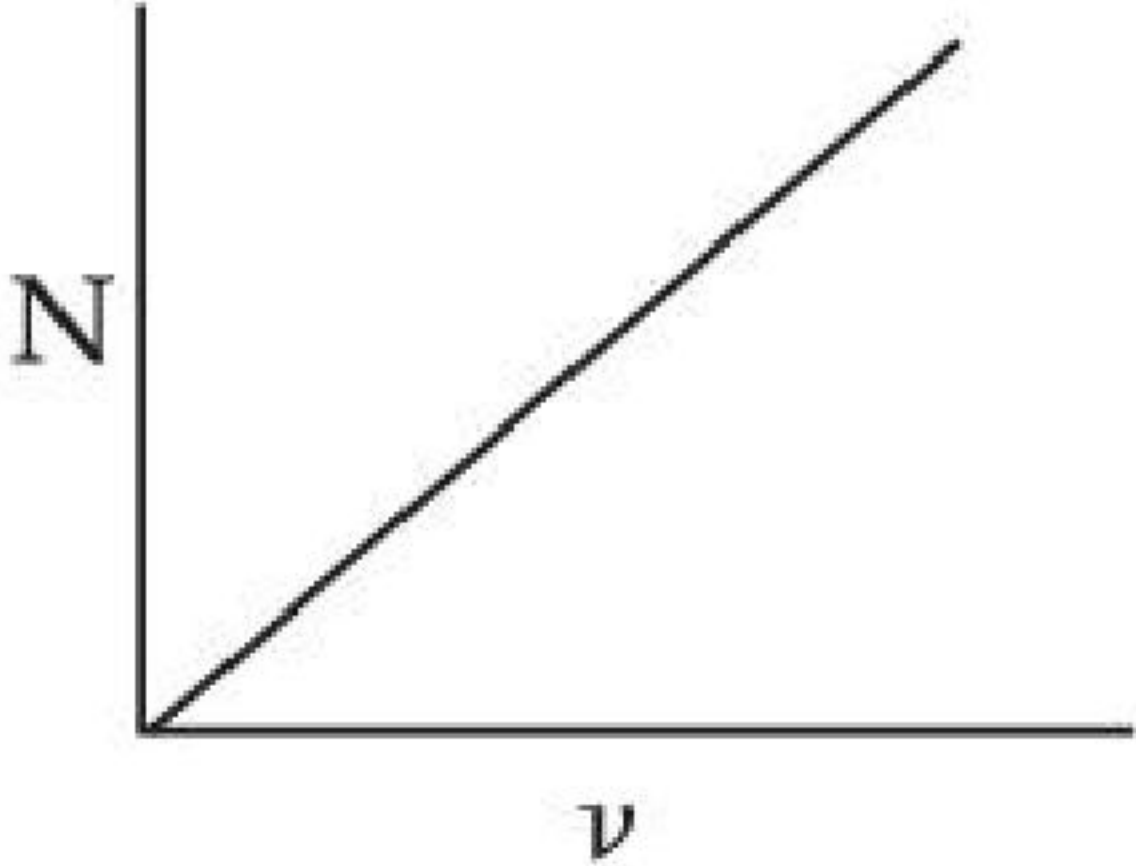
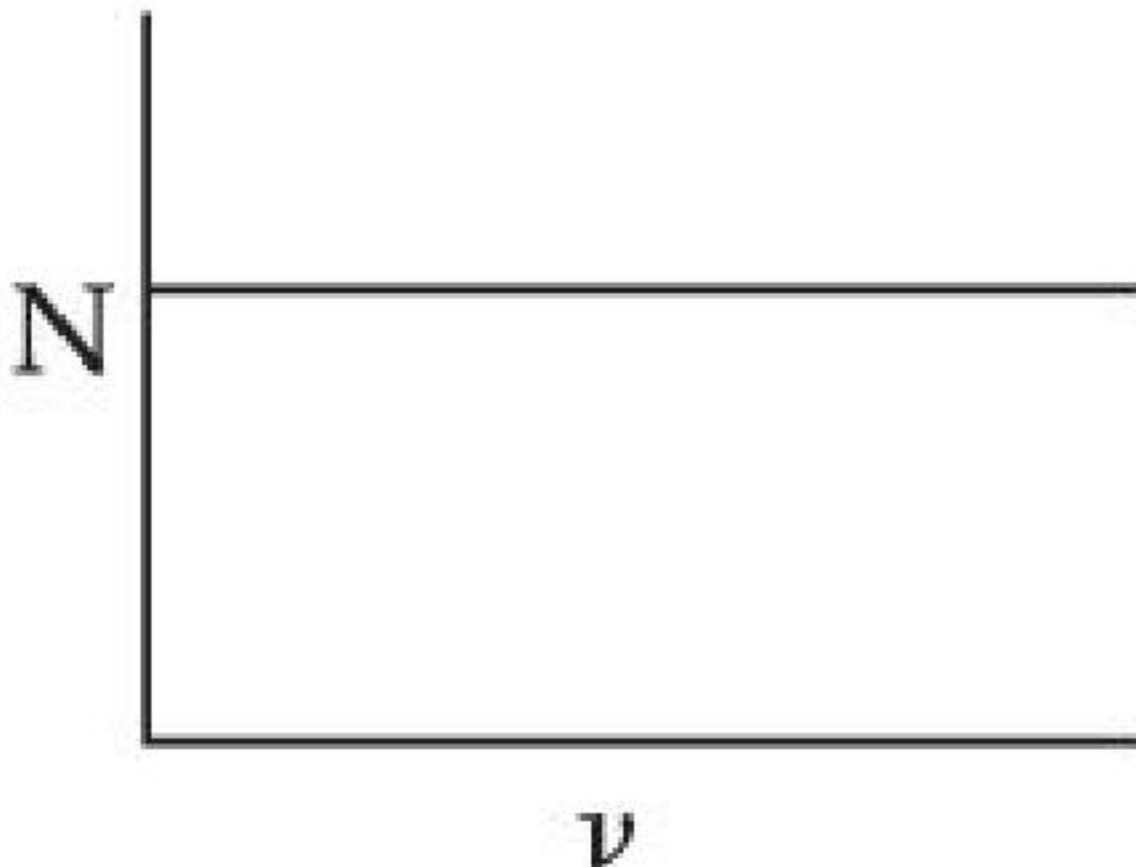
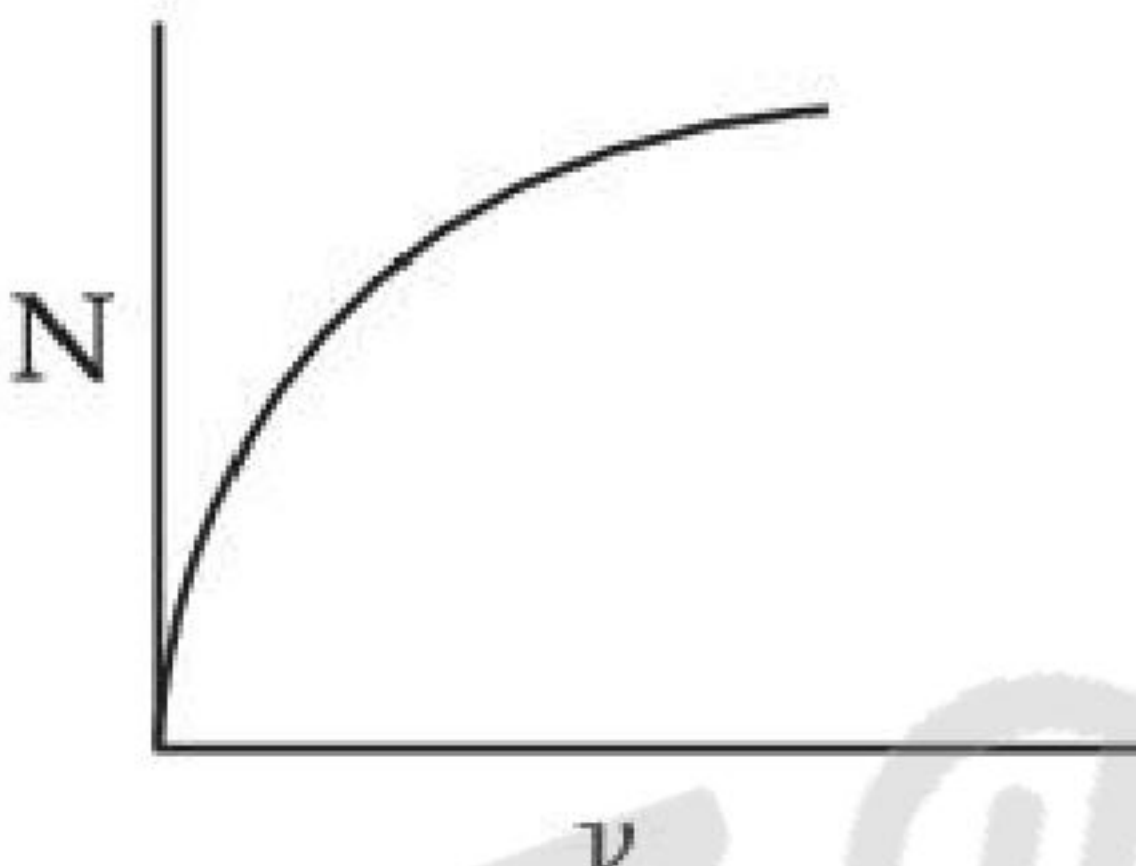


|    |                                     |
|----|-------------------------------------|
| C: | $\frac{\sqrt{3} - 1}{\sqrt{3} + 1}$ |
| D: | $\frac{1}{3}$                       |

|                |                                                                      |
|----------------|----------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                    |
| Item No:       | 33                                                                   |
| Question ID:   | 100233                                                               |
| Question Type: | MCQ                                                                  |
| Question:      | If $t = \sqrt{x} + 4$ , then $\left(\frac{dx}{dt}\right)_{t=4}$ is : |
| A:             | 4                                                                    |
| B:             | zero                                                                 |
| C:             | 8                                                                    |
| D:             | 16                                                                   |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Item No:       | 34                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Question ID:   | 100234                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Question:      | <p>A smooth circular groove has a smooth vertical wall as shown in figure. A block of mass <math>m</math> moves against the wall with a speed <math>v</math>. Which of the following curve represents the correct relation between the normal reaction on the block by the wall (<math>N</math>) and speed of the block (<math>v</math>) ?</p>  |
| A:             |                                                                                                                                                                                                                                                                                                                                                 |



|    |                                                                                     |
|----|-------------------------------------------------------------------------------------|
| B: |    |
| C: |   |
| D: |  |

|                |                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                           |
| Item No:       | 35                                                                                                                                                                          |
| Question ID:   | 100235                                                                                                                                                                      |
| Question Type: | MCQ                                                                                                                                                                         |
| Question:      | A ball is projected with kinetic energy $E$ , at an angle of $60^\circ$ to the horizontal. The kinetic energy of this ball at the highest point of its flight will become : |
| A:             | Zero                                                                                                                                                                        |
| B:             | $\frac{E}{2}$                                                                                                                                                               |
| C:             | $\frac{E}{4}$                                                                                                                                                               |
| D:             | $E$                                                                                                                                                                         |

|        |                   |
|--------|-------------------|
| Topic: | Physics-Section A |
|--------|-------------------|



|                |                                                                                                                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item No:       | 36                                                                                                                                                                                                                                                      |
| Question ID:   | <b>100236</b>                                                                                                                                                                                                                                           |
| Question Type: | MCQ                                                                                                                                                                                                                                                     |
| Question:      | Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-3\hat{i} - 2\hat{j} + \hat{k}$ respectively. The magnitude of position vector of centre of mass of this system will be similar to the magnitude of vector : |
| A:             | $\hat{i} + 2\hat{j} + \hat{k}$                                                                                                                                                                                                                          |
| B:             | $-3\hat{i} - 2\hat{j} + \hat{k}$                                                                                                                                                                                                                        |
| C:             | $-2\hat{i} + 2\hat{k}$                                                                                                                                                                                                                                  |
| D:             | $-2\hat{i} - \hat{j} + 2\hat{k}$                                                                                                                                                                                                                        |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Item No:       | 37                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Question ID:   | <b>100237</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> Clothes containing oil or grease stains cannot be cleaned by water wash.</p> <p><b>Reason (R) :</b> Because the angle of contact between the oil/grease and water is obtuse.</p> <p>In the light of the above statements, choose the correct answer from the option given below.</p> |
| A:             | Both (A) and (R) are true and (R) is the correct explanation of (A)                                                                                                                                                                                                                                                                                                                                                                            |
| B:             | Both (A) and (R) are true but (R) is not the correct explanation of (A)                                                                                                                                                                                                                                                                                                                                                                        |
| C:             | (A) is true but (R) is false                                                                                                                                                                                                                                                                                                                                                                                                                   |
| D:             | (A) is false but (R) is true                                                                                                                                                                                                                                                                                                                                                                                                                   |

|          |                   |
|----------|-------------------|
| Topic:   | Physics-Section A |
| Item No: | 38                |

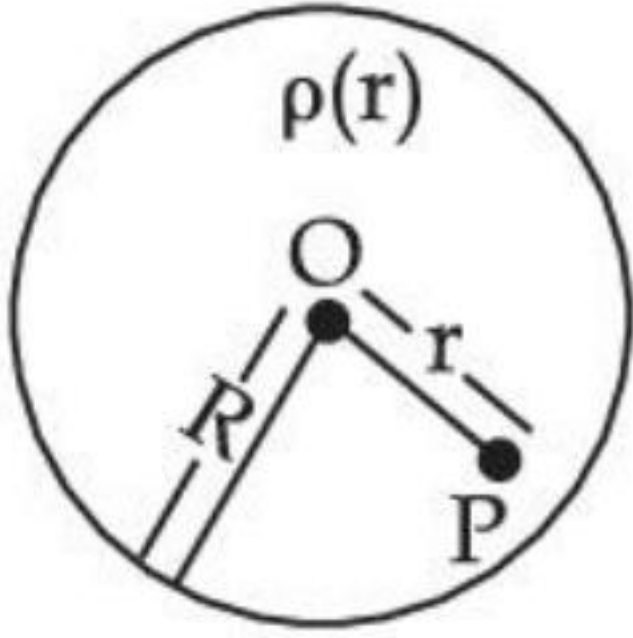


|                |                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Question ID:   | <b>100238</b>                                                                                                                                      |
| Question Type: | MCQ                                                                                                                                                |
| Question:      | If the length of a wire is made double and radius is halved of its respective values. Then, the Young's modulus of the material of the wire will : |
| A:             | remain same                                                                                                                                        |
| B:             | become 8 times its initial value                                                                                                                   |
| C:             | become $\frac{1}{4}^{\text{th}}$ of its initial value                                                                                              |
| D:             | become 4 times its initial value                                                                                                                   |

|                |                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                 |
| Item No:       | 39                                                                                                                                                                                                |
| Question ID:   | <b>100239</b>                                                                                                                                                                                     |
| Question Type: | MCQ                                                                                                                                                                                               |
| Question:      | The time period of oscillation of a simple pendulum of length L suspended from the roof of a vehicle, which moves without friction down an inclined plane of inclination $\alpha$ , is given by : |
| A:             | $2\pi\sqrt{L/(g \cos\alpha)}$                                                                                                                                                                     |
| B:             | $2\pi\sqrt{L/(g \sin\alpha)}$                                                                                                                                                                     |
| C:             | $2\pi\sqrt{L/g}$                                                                                                                                                                                  |
| D:             | $2\pi\sqrt{L/(g \tan\alpha)}$                                                                                                                                                                     |

|                |                   |
|----------------|-------------------|
| Topic:         | Physics-Section A |
| Item No:       | 40                |
| Question ID:   | <b>100240</b>     |
| Question Type: | MCQ               |



|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p>A spherically symmetric charge distribution is considered with charge density varying as</p> $\rho(r) = \begin{cases} \rho_0 \left( \frac{3}{4} - \frac{r}{R} \right) & \text{for } r \leq R \\ \text{zero} & \text{for } r > R \end{cases}$ <p>Where, <math>r(r &lt; R)</math> is the distance from the centre O (as shown in figure). The electric field at point P will be :</p>  |
| A:        | $\frac{\rho_0 r}{4 \epsilon_0} \left( \frac{3}{4} - \frac{r}{R} \right)$                                                                                                                                                                                                                                                                                                                                                                                                  |
| B:        | $\frac{\rho_0 r}{3 \epsilon_0} \left( \frac{3}{4} - \frac{r}{R} \right)$                                                                                                                                                                                                                                                                                                                                                                                                  |
| C:        | $\frac{\rho_0 r}{4 \epsilon_0} \left( 1 - \frac{r}{R} \right)$                                                                                                                                                                                                                                                                                                                                                                                                            |
| D:        | $\frac{\rho_0 r}{5 \epsilon_0} \left( 1 - \frac{r}{R} \right)$                                                                                                                                                                                                                                                                                                                                                                                                            |

|                |                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                          |
| Item No:       | 41                                                                                                                                                                                                                                                                                                                                                                                                         |
| Question ID:   | <b>100241</b>                                                                                                                                                                                                                                                                                                                                                                                              |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                        |
| Question:      | <p>Given below are two statements.</p> <p><b>Statement I :</b> Electric potential is constant within and at the surface of each conductor.</p> <p><b>Statement II :</b> Electric field just outside a charged conductor is perpendicular to the surface of the conductor at every point.</p> <p>In the light of the above statements, choose the most appropriate answer from the options given below.</p> |



|    |                                                                    |
|----|--------------------------------------------------------------------|
| A: | Both <b>statement I</b> and <b>statement II</b> are correct        |
| B: | Both <b>statement I</b> and <b>statement II</b> are incorrect      |
| C: | <b>Statement I</b> is correct but <b>statement II</b> is incorrect |
| D: | <b>Statement I</b> is incorrect but <b>statement II</b> is correct |

|                |                                                                                                                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                           |
| Item No:       | 42                                                                                                                                                                                                          |
| Question ID:   | <b>100242</b>                                                                                                                                                                                               |
| Question Type: | MCQ                                                                                                                                                                                                         |
| Question:      | Two metallic wires of identical dimensions are connected in series. If $\sigma_1$ and $\sigma_2$ are the conductivities of the these wires respectively, the effective conductivity of the combination is : |
| A:             | $\frac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$                                                                                                                                                             |
| B:             | $\frac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$                                                                                                                                                            |
| C:             | $\frac{\sigma_1 + \sigma_2}{2\sigma_1 \sigma_2}$                                                                                                                                                            |
| D:             | $\frac{\sigma_1 + \sigma_2}{\sigma_1 \sigma_2}$                                                                                                                                                             |

|                |                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                 |
| Item No:       | 43                                                                                                                                                                                                |
| Question ID:   | <b>100243</b>                                                                                                                                                                                     |
| Question Type: | MCQ                                                                                                                                                                                               |
| Question:      | An alternating emf $E = 440 \sin 100\pi t$ is applied to a circuit containing an inductance of $\frac{\sqrt{2}}{\pi}$ H.<br>If an a.c. ammeter is connected in the circuit, its reading will be : |
| A:             | 4.4 A                                                                                                                                                                                             |



|    |        |
|----|--------|
| B: | 1.55 A |
| C: | 2.2 A  |
| D: | 3.11 A |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                                                |
| Item No:       | 44                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Question ID:   | <b>100244</b>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Question Type: | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Question:      | <p>A coil of inductance 1 H and resistance <math>100\ \Omega</math> is connected to a battery of 6 V. Determine approximately :</p> <p>(a) The time elapsed before the current acquires half of its steady - state value.</p> <p>(b) The energy stored in the magnetic field associated with the coil at an instant 15 ms after the circuit is switched on. (Given <math>\ln 2 = 0.693</math>, <math>e^{-3/2} = 0.25</math>)</p> |
| A:             | $t = 10\text{ ms}; U = 2\text{ mJ}$                                                                                                                                                                                                                                                                                                                                                                                              |
| B:             | $t = 10\text{ ms}; U = 1\text{ mJ}$                                                                                                                                                                                                                                                                                                                                                                                              |
| C:             | $t = 7\text{ ms}; U = 1\text{ mJ}$                                                                                                                                                                                                                                                                                                                                                                                               |
| D:             | $t = 7\text{ ms}; U = 2\text{ mJ}$                                                                                                                                                                                                                                                                                                                                                                                               |

| Topic:            | Physics-Section A                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|-------------|---------------------------------|------------|-------------------------|---------------|----------------------------|-------------------|-----------------------------------------|
| Item No:          | 45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| Question ID:      | <b>100245</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| Question Type:    | MCQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| Question:         | <p><b>Match List - I with List - II :</b></p> <table> <tr> <th><b>List - I</b></th><th><b>List - II</b></th></tr> <tr> <td>(a) UV rays</td><td>(i) Diagnostic tool in medicine</td></tr> <tr> <td>(b) X-rays</td><td>(ii) Water purification</td></tr> <tr> <td>(c) Microwave</td><td>(iii) Communication, Radar</td></tr> <tr> <td>(d) Infrared wave</td><td>(iv) Improving visibility in foggy days</td></tr> </table> <p>Choose the correct answer from the options given below :</p> | <b>List - I</b> | <b>List - II</b> | (a) UV rays | (i) Diagnostic tool in medicine | (b) X-rays | (ii) Water purification | (c) Microwave | (iii) Communication, Radar | (d) Infrared wave | (iv) Improving visibility in foggy days |
| <b>List - I</b>   | <b>List - II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| (a) UV rays       | (i) Diagnostic tool in medicine                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| (b) X-rays        | (ii) Water purification                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| (c) Microwave     | (iii) Communication, Radar                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |
| (d) Infrared wave | (iv) Improving visibility in foggy days                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                  |             |                                 |            |                         |               |                            |                   |                                         |



|    |                                        |
|----|----------------------------------------|
| A: | (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv) |
| B: | (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv) |
| C: | (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i) |
| D: | (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv) |

|                |                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                   |
| Item No:       | 46                                                                                                                                                                                  |
| Question ID:   | <b>100246</b>                                                                                                                                                                       |
| Question Type: | MCQ                                                                                                                                                                                 |
| Question:      | The kinetic energy of emitted electron is E when the light incident on the metal has wavelength $\lambda$ . To double the kinetic energy, the incident light must have wavelength : |
| A:             | $\frac{hc}{E\lambda - hc}$                                                                                                                                                          |
| B:             | $\frac{hc\lambda}{E\lambda + hc}$                                                                                                                                                   |
| C:             | $\frac{h\lambda}{E\lambda + hc}$                                                                                                                                                    |
| D:             | $\frac{hc\lambda}{E\lambda - hc}$                                                                                                                                                   |

|                |                                                                                                                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                         |
| Item No:       | 47                                                                                                                                                                                                                                        |
| Question ID:   | <b>100247</b>                                                                                                                                                                                                                             |
| Question Type: | MCQ                                                                                                                                                                                                                                       |
| Question:      | Find the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its (i) second permitted energy level to the first level, and (ii) the highest permitted energy level to the first permitted level. |
| A:             | 3 : 4                                                                                                                                                                                                                                     |
| B:             | 4 : 3                                                                                                                                                                                                                                     |



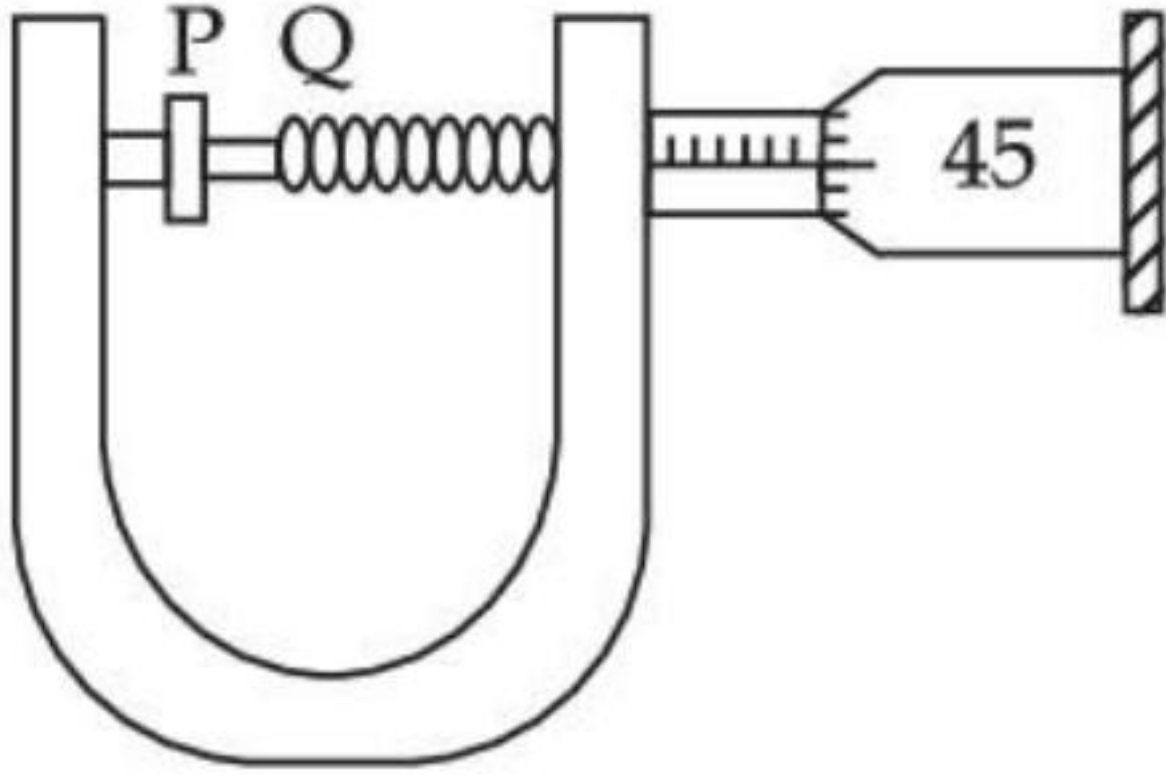
|    |       |
|----|-------|
| C: | 1 : 4 |
| D: | 4 : 1 |

|                |                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                           |
| Item No:       | 48                                                                                                          |
| Question ID:   | <b>100248</b>                                                                                               |
| Question Type: | MCQ                                                                                                         |
| Question:      | Find the modulation index of an AM wave having 8 V variation where maximum amplitude of the AM wave is 9 V. |
| A:             | 0.8                                                                                                         |
| B:             | 0.5                                                                                                         |
| C:             | 0.2                                                                                                         |
| D:             | 0.1                                                                                                         |

|                |                                                                                                                                                                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section A                                                                                                                                                                                                                            |
| Item No:       | 49                                                                                                                                                                                                                                           |
| Question ID:   | <b>100249</b>                                                                                                                                                                                                                                |
| Question Type: | MCQ                                                                                                                                                                                                                                          |
| Question:      | A travelling microscope has 20 divisions per cm on the main scale while its vernier scale has total 50 divisions and 25 vernier scale divisions are equal to 24 main scale divisions, what is the least count of the travelling microscope ? |
| A:             | 0.001 cm                                                                                                                                                                                                                                     |
| B:             | 0.002 mm                                                                                                                                                                                                                                     |
| C:             | 0.002 cm                                                                                                                                                                                                                                     |
| D:             | 0.005 cm                                                                                                                                                                                                                                     |

|                |                   |
|----------------|-------------------|
| Topic:         | Physics-Section A |
| Item No:       | 50                |
| Question ID:   | <b>100250</b>     |
| Question Type: | MCQ               |



|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p>In an experiment to find out the diameter of wire using screw gauge, the following observations were noted :</p>  <p>(A) Screw moves 0.5 mm on main scale in one complete rotation<br/>         (B) Total divisions on circular scale = 50<br/>         (C) Main scale reading is 2.5 mm<br/>         (D) 45<sup>th</sup> division of circular scale is in the pitch line<br/>         (E) Instrument has 0.03 mm negative error</p> <p>Then the diameter of wire is :</p> |
|           | A: 2.92 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           | B: 2.54 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           | C: 2.98 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           | D: 3.45 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Item No:       | 51                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Question ID:   | 100251                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Question:      | <p>An object is projected in the air with initial velocity <math>u</math> at an angle <math>\theta</math>. The projectile motion is such that the horizontal range <math>R</math>, is maximum. Another object is projected in the air with a horizontal range half of the range of first object. The initial velocity remains same in both the case. The value of the angle of projection, at which the second object is projected, will be _____ degree.</p> |

|              |                   |
|--------------|-------------------|
| Topic:       | Physics-Section B |
| Item No:     | 52                |
| Question ID: | 100252            |



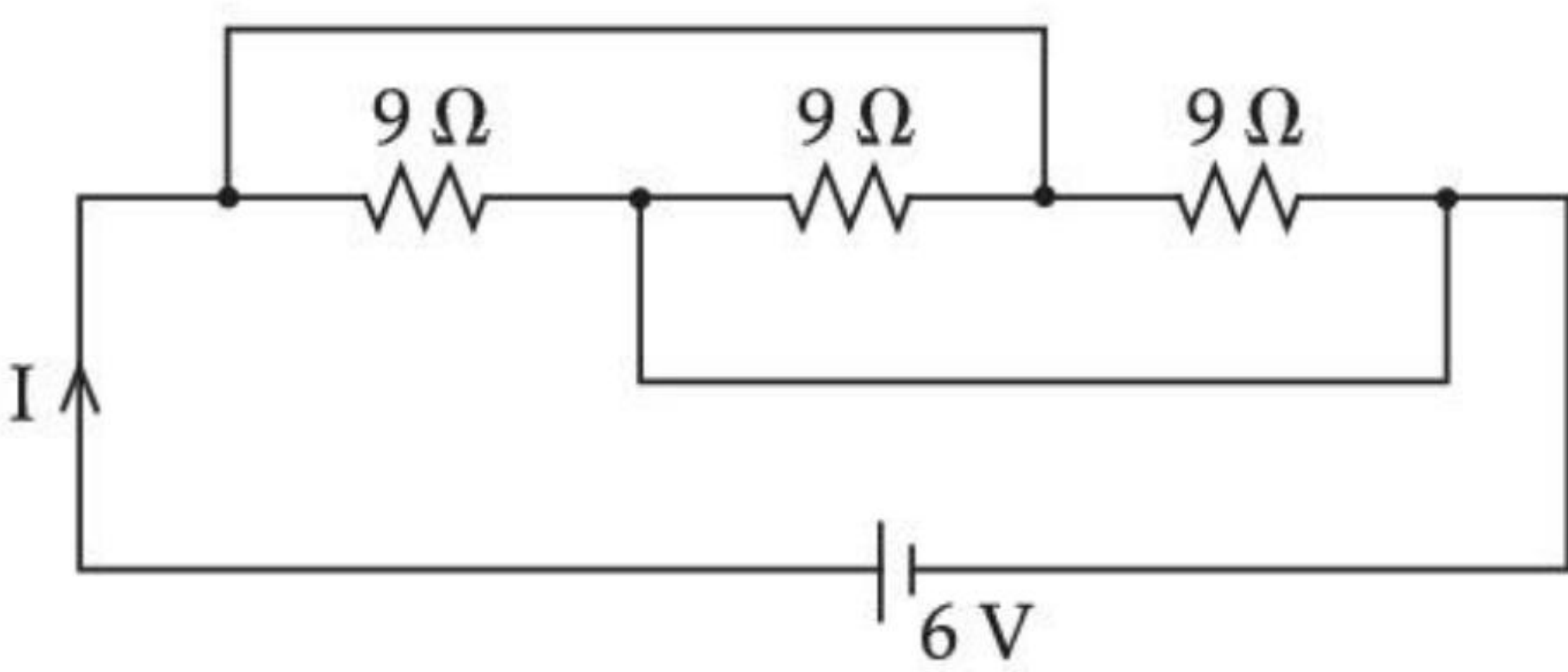
|                |                                                                                                                                                                                                                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                           |
| Question:      | <p>If the acceleration due to gravity experienced by a point mass at a height <math>h</math> above the surface of earth is same as that of the acceleration due to gravity at a depth <math>\alpha h</math> (<math>h \ll R_e</math>) from the earth surface. The value of <math>\alpha</math> will be _____.</p> <p>(use <math>R_e = 6400</math> km)</p> |

|                |                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                                                                                |
| Item No:       | 53                                                                                                                                                                                                                                                                                                                                                                               |
| Question ID:   | <b>100253</b>                                                                                                                                                                                                                                                                                                                                                                    |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                   |
| Question:      | <p>The pressure <math>P_1</math> and density <math>d_1</math> of diatomic gas <math>\left(\gamma = \frac{7}{5}\right)</math> changes suddenly to <math>P_2(&gt;P_1)</math> and <math>d_2</math> respectively during an adiabatic process. The temperature of the gas increases and becomes _____ times of its initial temperature. (given <math>\frac{d_2}{d_1} = 32</math>)</p> |

|                |                                                                                                                                                                                                                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                           |
| Item No:       | 54                                                                                                                                                                                                                                                                                                          |
| Question ID:   | <b>100254</b>                                                                                                                                                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                              |
| Question:      | <p>One mole of a monoatomic gas is mixed with three moles of a diatomic gas. The molecular specific heat of mixture at constant volume is <math>\frac{\alpha^2}{4} R</math> J/mol K; then the value of <math>\alpha</math> will be _____. (Assume that the given diatomic gas has no vibrational mode).</p> |

|                |                   |
|----------------|-------------------|
| Topic:         | Physics-Section B |
| Item No:       | 55                |
| Question ID:   | <b>100255</b>     |
| Question Type: | Numeric Answer    |



|           |                                                                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p>The current I flowing through the given circuit will be _____ A.</p>  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                |                                                                                                                                                                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                                                                                           |
| Item No:       | 56                                                                                                                                                                                                                                                          |
| Question ID:   | <b>100256</b>                                                                                                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                              |
| Question:      | <p>A closely wound circular coil of radius 5 cm produces a magnetic field of <math>37.68 \times 10^{-4}</math> T at its center. The current through the coil is _____ A.</p> <p>[Given, number of turns in the coil is 100 and <math>\pi = 3.14</math>]</p> |

|                |                                                                                                                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                              |
| Item No:       | 57                                                                                                                                                                                                                                                                                             |
| Question ID:   | <b>100257</b>                                                                                                                                                                                                                                                                                  |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                 |
| Question:      | <p>Two light beams of intensities <math>4I</math> and <math>9I</math> interfere on a screen. The phase difference between these beams on the screen at point A is zero and at point B is <math>\pi</math>. The difference of resultant intensities, at the point A and B, will be _____ I.</p> |

|                |                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                           |
| Item No:       | 58                                                                                                                                                                          |
| Question ID:   | <b>100258</b>                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                              |
| Question:      | <p>A wire of length 314 cm carrying current of 14 A is bent to form a circle. The magnetic moment of the coil is _____ A-m<sup>2</sup>. [Given <math>\pi = 3.14</math>]</p> |



|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Item No:       | 59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Question ID:   | <b>100259</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Question:      | The X-Y plane be taken as the boundary between two transparent media $M_1$ and $M_2$ . $M_1$ in $Z \geq 0$ has a refractive index of $\sqrt{2}$ and $M_2$ with $Z < 0$ has a refractive index of $\sqrt{3}$ . A ray of light travelling in $M_1$ along the direction given by the vector $\vec{P} = 4\sqrt{3}\hat{i} - 3\sqrt{3}\hat{j} - 5\hat{k}$ , is incident on the plane of separation. The value of difference between the angle of incident in $M_1$ and the angle of refraction in $M_2$ will be _____ degree. |

|                |                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Physics-Section B                                                                                                                                                                              |
| Item No:       | 60                                                                                                                                                                                             |
| Question ID:   | <b>100260</b>                                                                                                                                                                                  |
| Question Type: | Numeric Answer                                                                                                                                                                                 |
| Question:      | If the potential barrier across a p-n junction is 0.6 V. Then the electric field intensity, in the depletion region having the width of $6 \times 10^{-6}$ m, will be _____ $\times 10^5$ N/C. |

|                |                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                     |
| Item No:       | 61                                                                                                      |
| Question ID:   | <b>100261</b>                                                                                           |
| Question Type: | MCQ                                                                                                     |
| Question:      | Which of the following pair of molecules contain odd electron molecule and an expanded octet molecule ? |
| A:             | $\text{BCl}_3$ and $\text{SF}_6$                                                                        |
| B:             | $\text{NO}$ and $\text{H}_2\text{SO}_4$                                                                 |
| C:             | $\text{SF}_6$ and $\text{H}_2\text{SO}_4$                                                               |
| D:             | $\text{BCl}_3$ and $\text{NO}$                                                                          |

|        |                     |
|--------|---------------------|
| Topic: | Chemistry-Section A |
|--------|---------------------|



|                |                                                                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item No:       | 62                                                                                                                                                                                                                                                |
| Question ID:   | <b>100262</b>                                                                                                                                                                                                                                     |
| Question Type: | MCQ                                                                                                                                                                                                                                               |
| Question:      | $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$ <p>20 g      5 g</p> <p>Consider the above reaction, the limiting reagent of the reaction and number of moles of <math>\text{NH}_3</math> formed respectively are :</p> |
| A:             | $\text{H}_2$ , 1.42 moles                                                                                                                                                                                                                         |
| B:             | $\text{H}_2$ , 0.71 moles                                                                                                                                                                                                                         |
| C:             | $\text{N}_2$ , 1.42 moles                                                                                                                                                                                                                         |
| D:             | $\text{N}_2$ , 0.71 moles                                                                                                                                                                                                                         |

|                |                                                                                                                                                                          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                      |
| Item No:       | 63                                                                                                                                                                       |
| Question ID:   | <b>100263</b>                                                                                                                                                            |
| Question Type: | MCQ                                                                                                                                                                      |
| Question:      | 100 mL of 5% (w/v) solution of NaCl in water was prepared in 250 mL beaker. Albumin from the egg was poured into NaCl solution and stirred well. This resulted in a/an : |
| A:             | Lyophilic sol                                                                                                                                                            |
| B:             | Lyophobic sol                                                                                                                                                            |
| C:             | Emulsion                                                                                                                                                                 |
| D:             | Precipitate                                                                                                                                                              |

|                |                     |
|----------------|---------------------|
| Topic:         | Chemistry-Section A |
| Item No:       | 64                  |
| Question ID:   | <b>100264</b>       |
| Question Type: | MCQ                 |



|           |                                                                                                                                                                                 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | The first ionization enthalpy of Na, Mg and Si, respectively, are : 496, 737 and 786 kJ mol <sup>-1</sup> .<br>The first ionization enthalpy (kJ mol <sup>-1</sup> ) of Al is : |
| A:        | 487                                                                                                                                                                             |
| B:        | 768                                                                                                                                                                             |
| C:        | 577                                                                                                                                                                             |
| D:        | 856                                                                                                                                                                             |

|                |                                                     |
|----------------|-----------------------------------------------------|
| Topic:         | Chemistry-Section A                                 |
| Item No:       | 65                                                  |
| Question ID:   | <b>100265</b>                                       |
| Question Type: | MCQ                                                 |
| Question:      | In metallurgy the term “gangue” is used for :       |
| A:             | Contamination of undesired earthy materials.        |
| B:             | Contamination of metals, other than desired metal.  |
| C:             | Minerals which are naturally occurring in pure form |
| D:             | Magnetic impurities in an ore.                      |

|                |                                                                                      |
|----------------|--------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                  |
| Item No:       | 66                                                                                   |
| Question ID:   | <b>100266</b>                                                                        |
| Question Type: | MCQ                                                                                  |
| Question:      | The reaction of zinc with excess of aqueous alkali, evolves hydrogen gas and gives : |
| A:             | Zn(OH) <sub>2</sub>                                                                  |
| B:             | ZnO                                                                                  |
| C:             | [Zn(OH) <sub>4</sub> ] <sup>2-</sup>                                                 |
| D:             | [ZnO <sub>2</sub> ] <sup>2-</sup>                                                    |

|          |                     |
|----------|---------------------|
| Topic:   | Chemistry-Section A |
| Item No: | 67                  |



|                |                                                                                  |
|----------------|----------------------------------------------------------------------------------|
| Question ID:   | <b>100267</b>                                                                    |
| Question Type: | MCQ                                                                              |
| Question:      | Lithium nitrate and sodium nitrate, when heated separately, respectively, give : |
| A:             | $\text{LiNO}_2$ and $\text{NaNO}_2$                                              |
| B:             | $\text{Li}_2\text{O}$ and $\text{Na}_2\text{O}$                                  |
| C:             | $\text{Li}_2\text{O}$ and $\text{NaNO}_2$                                        |
| D:             | $\text{LiNO}_2$ and $\text{Na}_2\text{O}$                                        |

|                |                                                                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                             |
| Item No:       | 68                                                                                                                                              |
| Question ID:   | <b>100268</b>                                                                                                                                   |
| Question Type: | MCQ                                                                                                                                             |
| Question:      | Number of lone pairs of electrons in the central atom of $\text{SCl}_2$ , $\text{O}_3$ , $\text{ClF}_3$ and $\text{SF}_6$ , respectively, are : |
| A:             | 0, 1, 2 and 2                                                                                                                                   |
| B:             | 2, 1, 2 and 0                                                                                                                                   |
| C:             | 1, 2, 2 and 0                                                                                                                                   |
| D:             | 2, 1, 0 and 2                                                                                                                                   |

|                |                                                                                     |
|----------------|-------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                 |
| Item No:       | 69                                                                                  |
| Question ID:   | <b>100269</b>                                                                       |
| Question Type: | MCQ                                                                                 |
| Question:      | In following pairs, the one in which both transition metal ions are colourless is : |
| A:             | $\text{Sc}^{3+}$ , $\text{Zn}^{2+}$                                                 |
| B:             | $\text{Ti}^{4+}$ , $\text{Cu}^{2+}$                                                 |
| C:             | $\text{V}^{2+}$ , $\text{Ti}^{3+}$                                                  |



|    |                                     |
|----|-------------------------------------|
| D: | $\text{Zn}^{2+}$ , $\text{Mn}^{2+}$ |
|----|-------------------------------------|

|                |                                                                                                                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                                     |
| Item No:       | 70                                                                                                                                                                                                                      |
| Question ID:   | <b>100270</b>                                                                                                                                                                                                           |
| Question Type: | MCQ                                                                                                                                                                                                                     |
| Question:      | In neutral or faintly alkaline medium, $\text{KMnO}_4$ being a powerful oxidant can oxidize, thiosulphate almost quantitatively, to sulphate. In this reaction overall change in oxidation state of manganese will be : |
| A:             | 5                                                                                                                                                                                                                       |
| B:             | 1                                                                                                                                                                                                                       |
| C:             | 0                                                                                                                                                                                                                       |
| D:             | 3                                                                                                                                                                                                                       |

|                |                                                       |
|----------------|-------------------------------------------------------|
| Topic:         | Chemistry-Section A                                   |
| Item No:       | 71                                                    |
| Question ID:   | <b>100271</b>                                         |
| Question Type: | MCQ                                                   |
| Question:      | Which among the following pairs has only herbicides ? |
| A:             | Aldrin and Dieldrin                                   |
| B:             | Sodium chlorate and Aldrin                            |
| C:             | Sodium arsenate and Dieldrin                          |
| D:             | Sodium chlorate and sodium arsenite.                  |

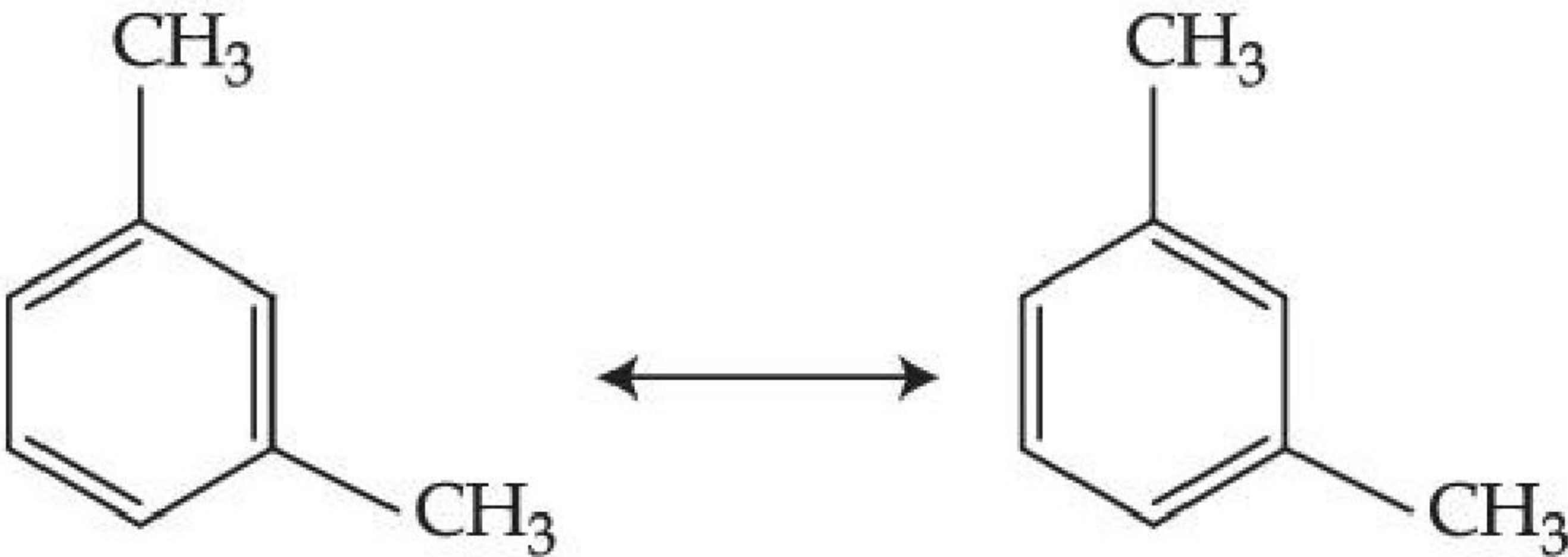
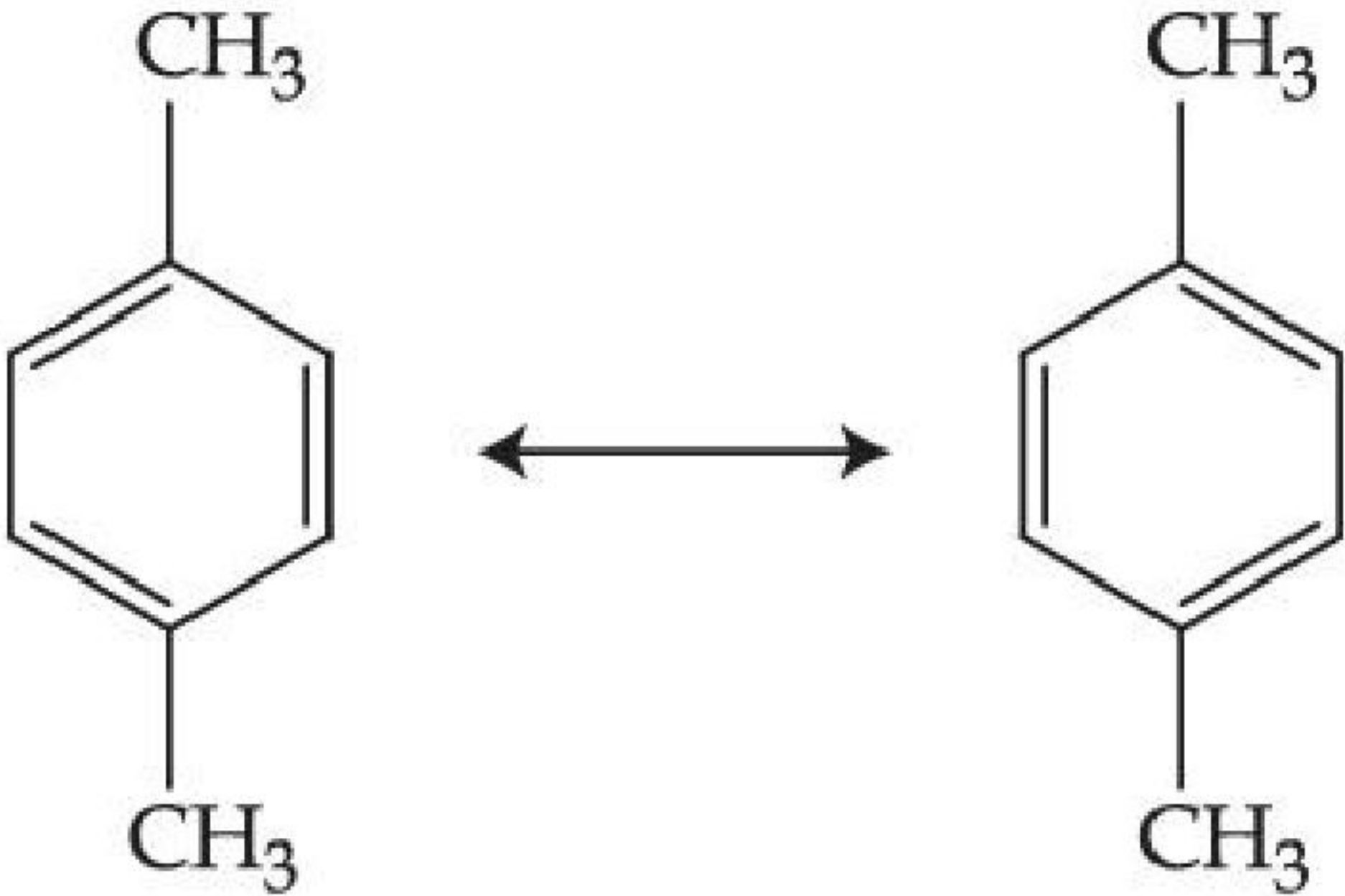
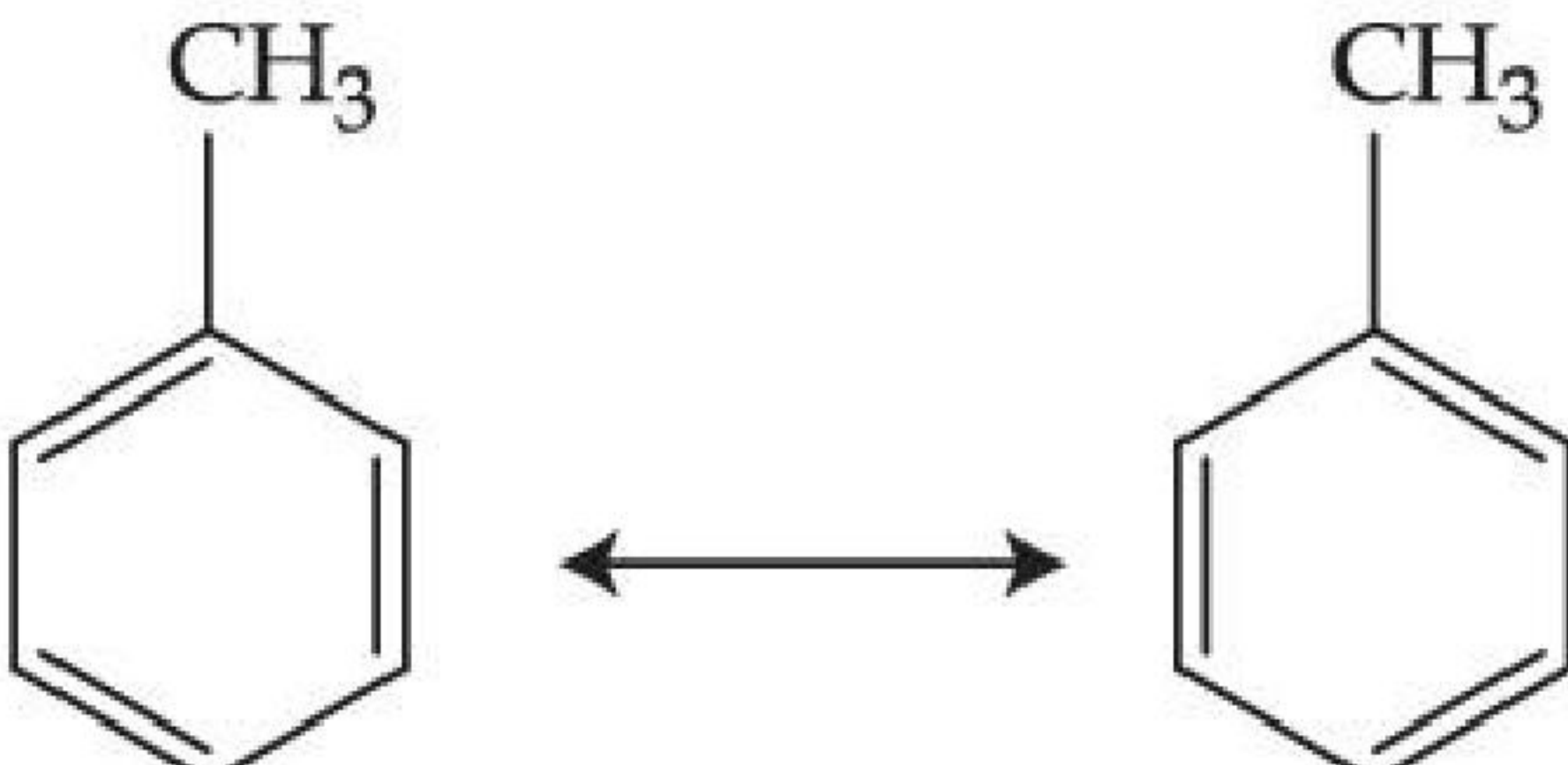
|                |                                                            |
|----------------|------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                        |
| Item No:       | 72                                                         |
| Question ID:   | <b>100272</b>                                              |
| Question Type: | MCQ                                                        |
| Question:      | Which among the following is the strongest Bronsted base ? |



|    |  |
|----|--|
| A: |  |
| B: |  |
| C: |  |
| D: |  |

|                |                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                         |
| Item No:       | 73                                                                                                                                                                          |
| Question ID:   | <b>100273</b>                                                                                                                                                               |
| Question Type: | MCQ                                                                                                                                                                         |
| Question:      | Which among the following pairs of the structures will give different products on ozonolysis ? (Consider the double bonds in the structures are rigid and not delocalized.) |

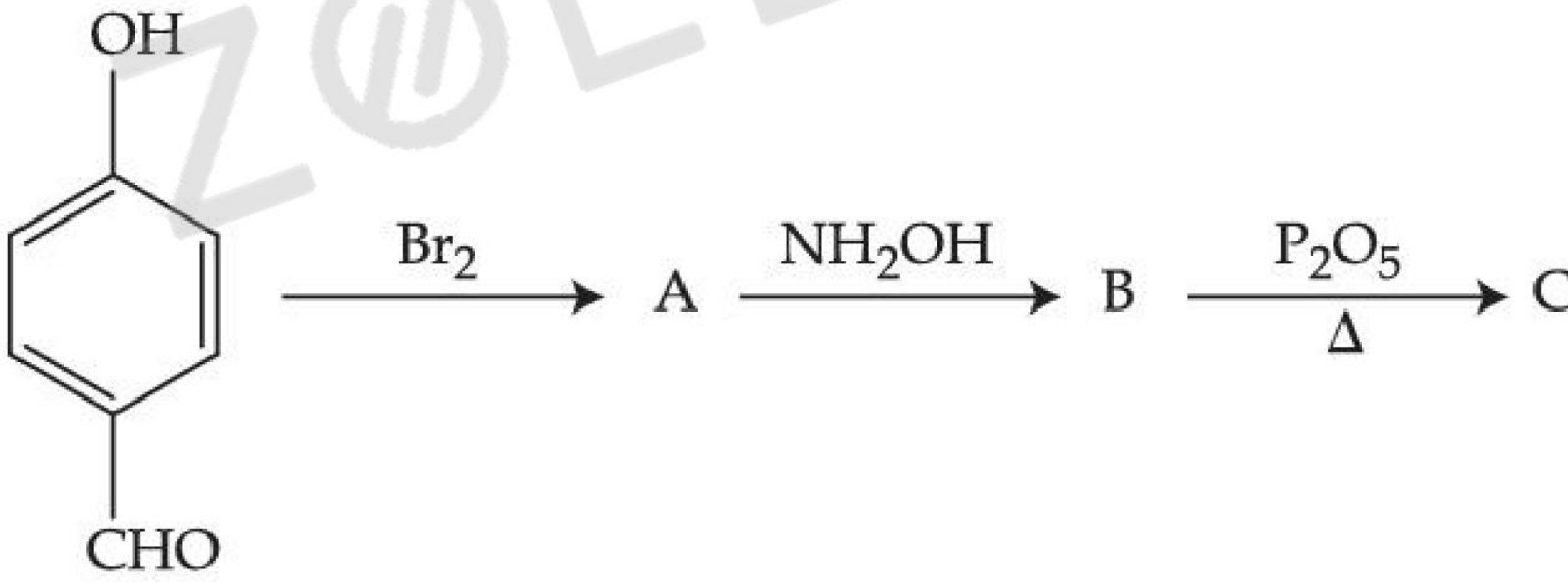
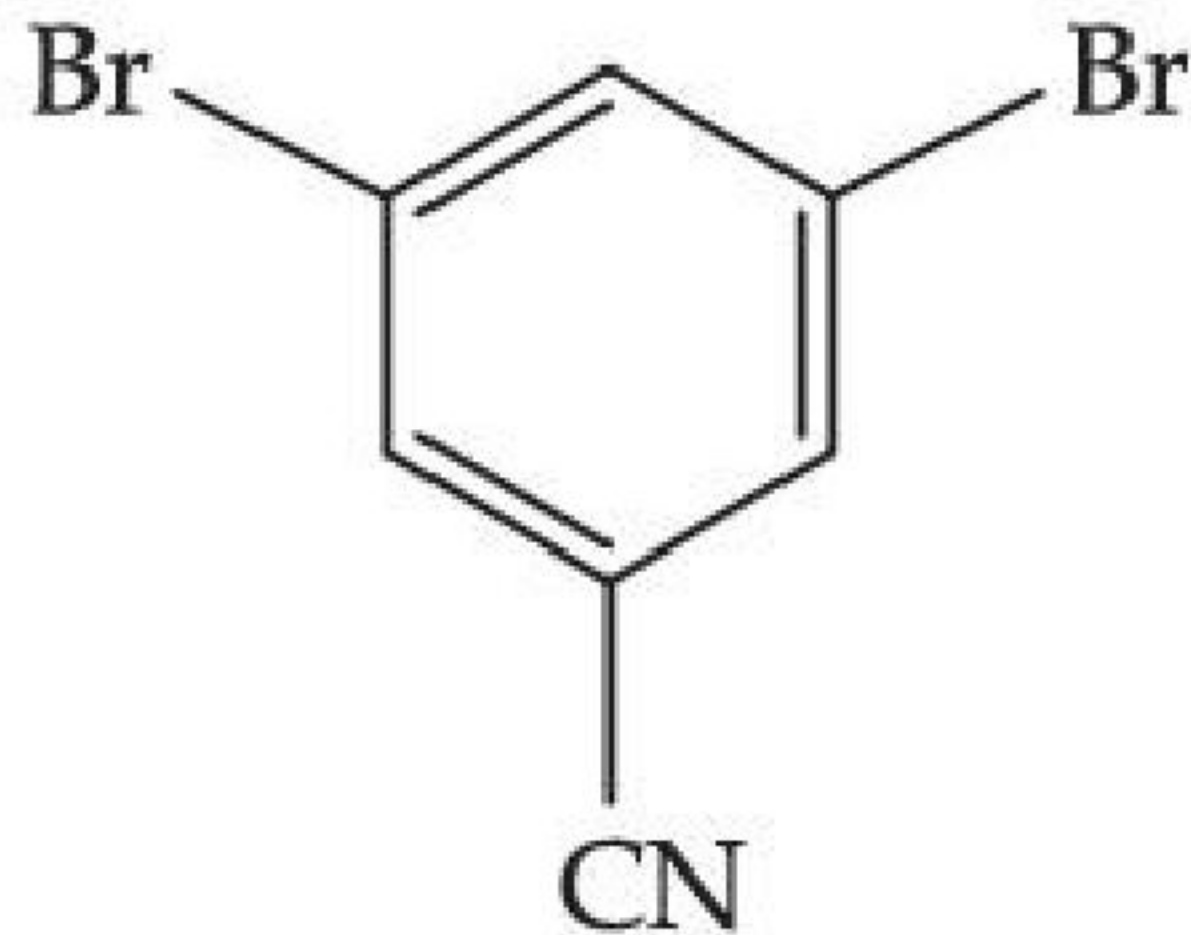


|    |                                                                                      |
|----|--------------------------------------------------------------------------------------|
| A: |    |
| B: |   |
| C: |  |
| D: |  |

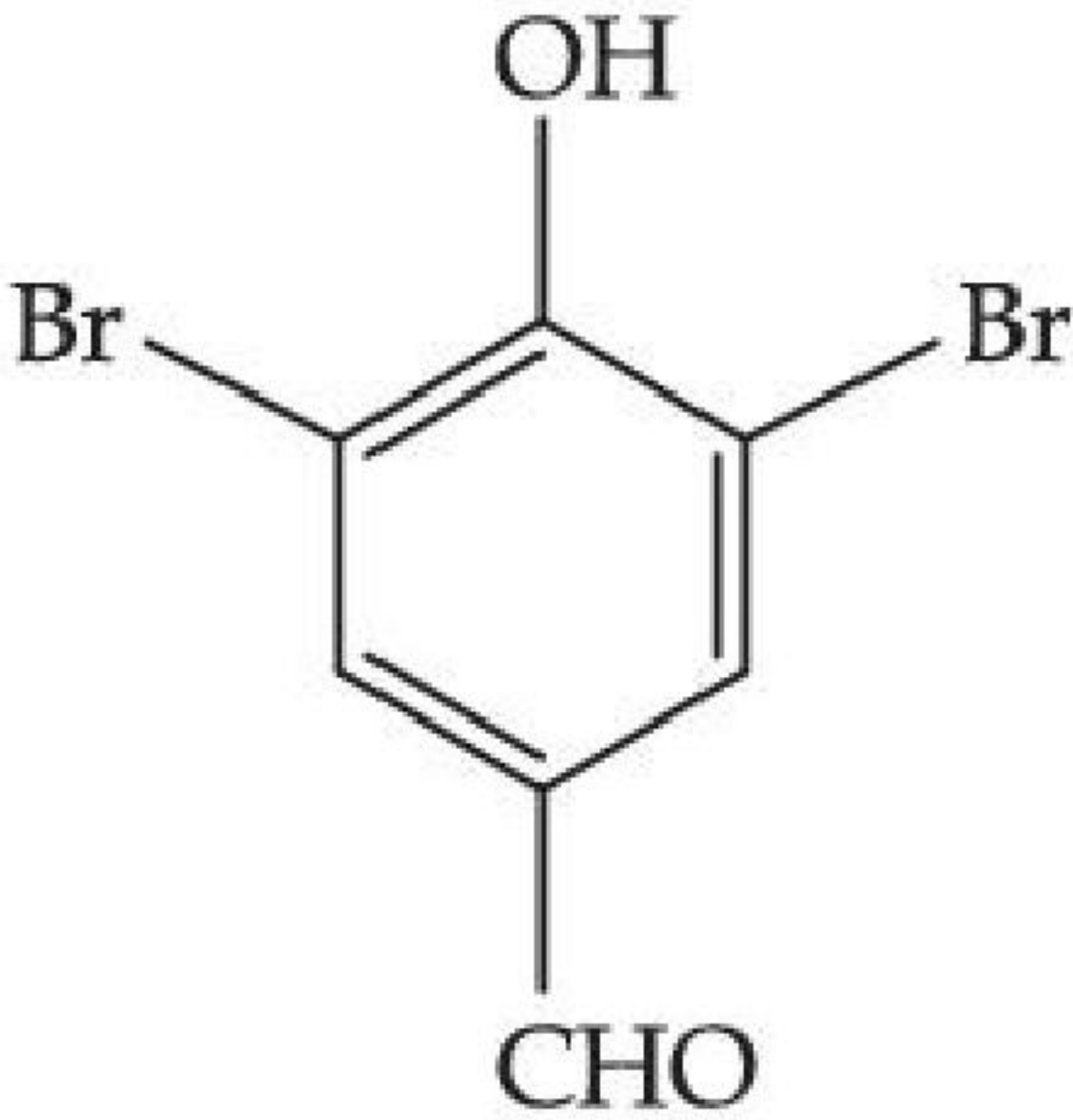
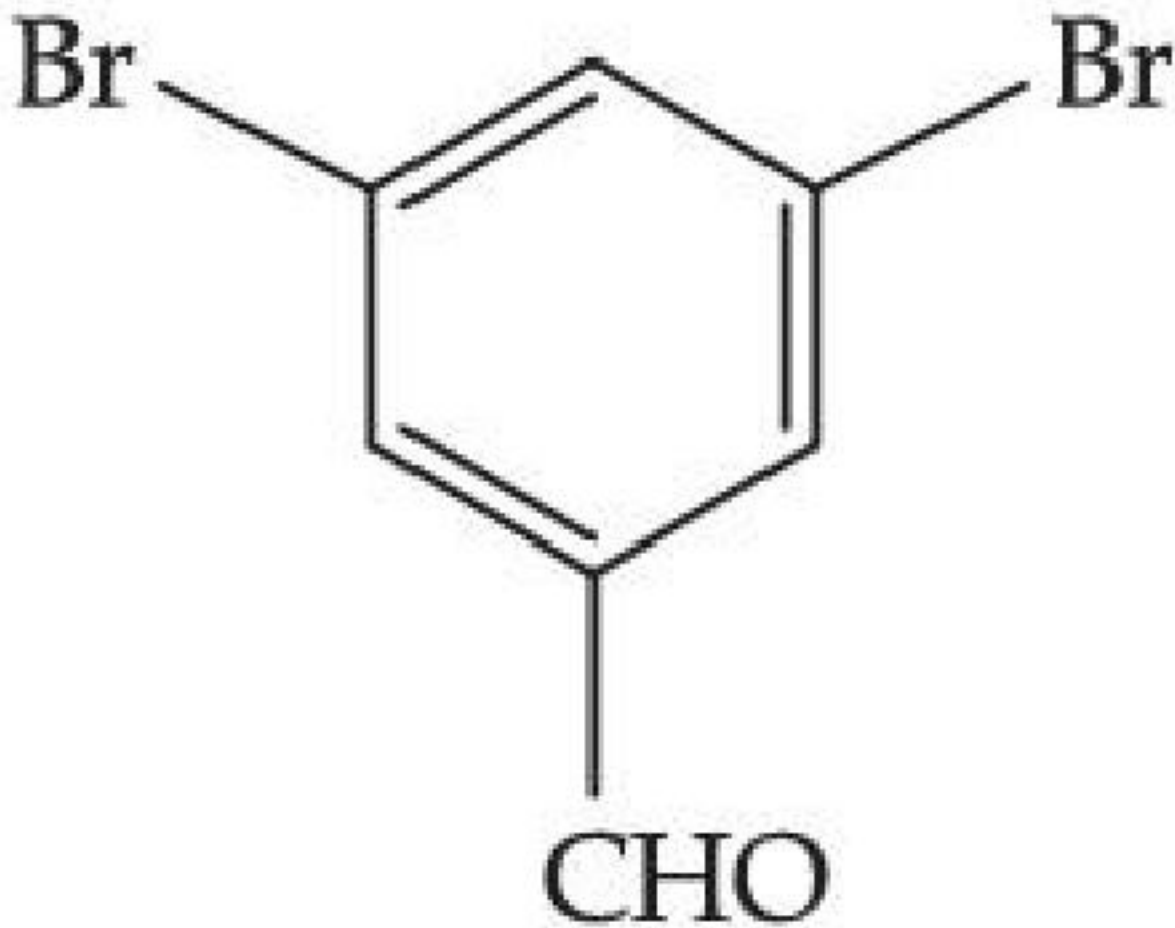
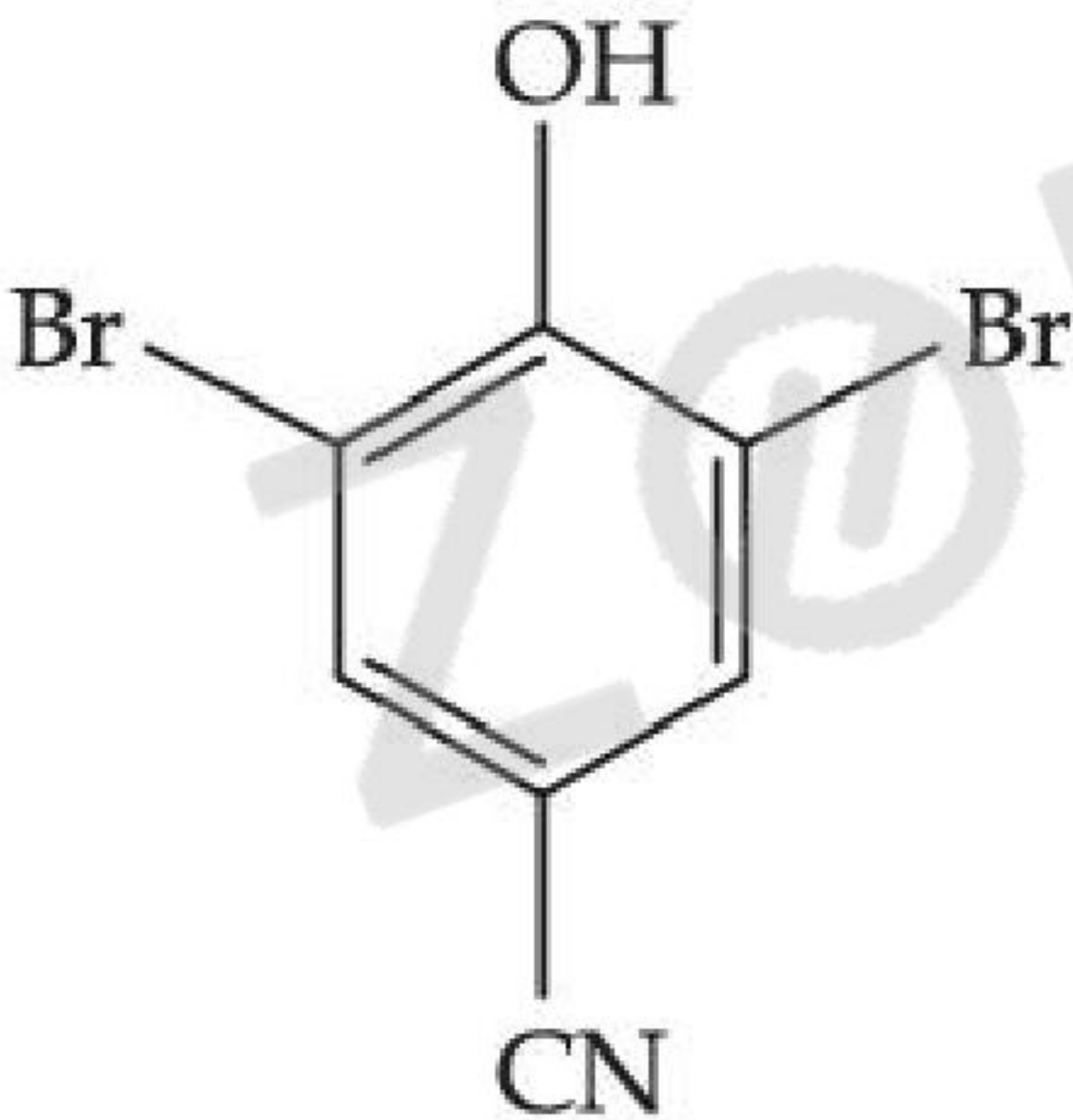
|                |                     |
|----------------|---------------------|
| Topic:         | Chemistry-Section A |
| Item No:       | 74                  |
| Question ID:   | <b>100274</b>       |
| Question Type: | MCQ                 |

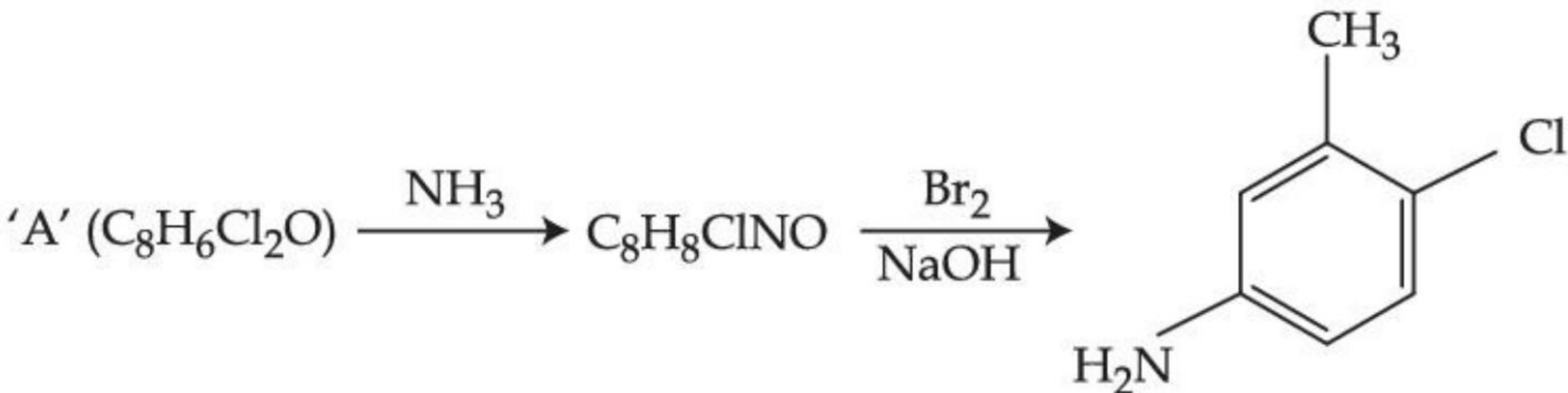


|           |                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p> <math display="block">\text{'A' (Major Product)} \xleftarrow[\text{C}_2\text{H}_5\text{OH} - \text{H}_2\text{O}]{\text{AgCN}} \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} \xrightarrow[\text{C}_2\text{H}_5\text{OH} - \text{H}_2\text{O}]{\text{NaCN}} \text{'B' (Major Product)}</math> </p> <p>Considering the above reactions, the compound 'A' and compound 'B' respectively are :</p> |
| A:        | $\text{CH}_3\text{CH}_2\text{CH}_2\text{N}^+\equiv\text{C}^- , \quad \text{CH}_3\text{CH}_2\text{CH}_2\text{N}^+\equiv\text{C}^-$                                                                                                                                                                                                                                                              |
| B:        | $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{N} , \quad \text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{N}$                                                                                                                                                                                                                                                                      |
| C:        | $\text{CH}_3\text{CH}_2\text{CH}_2\text{N}^+\equiv\text{C}^- , \quad \text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{N}$                                                                                                                                                                                                                                                                  |
| D:        | $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{N} , \quad \text{CH}_3\text{CH}_2\text{CH}_2\text{N}^+\equiv\text{C}^-$                                                                                                                                                                                                                                                                  |

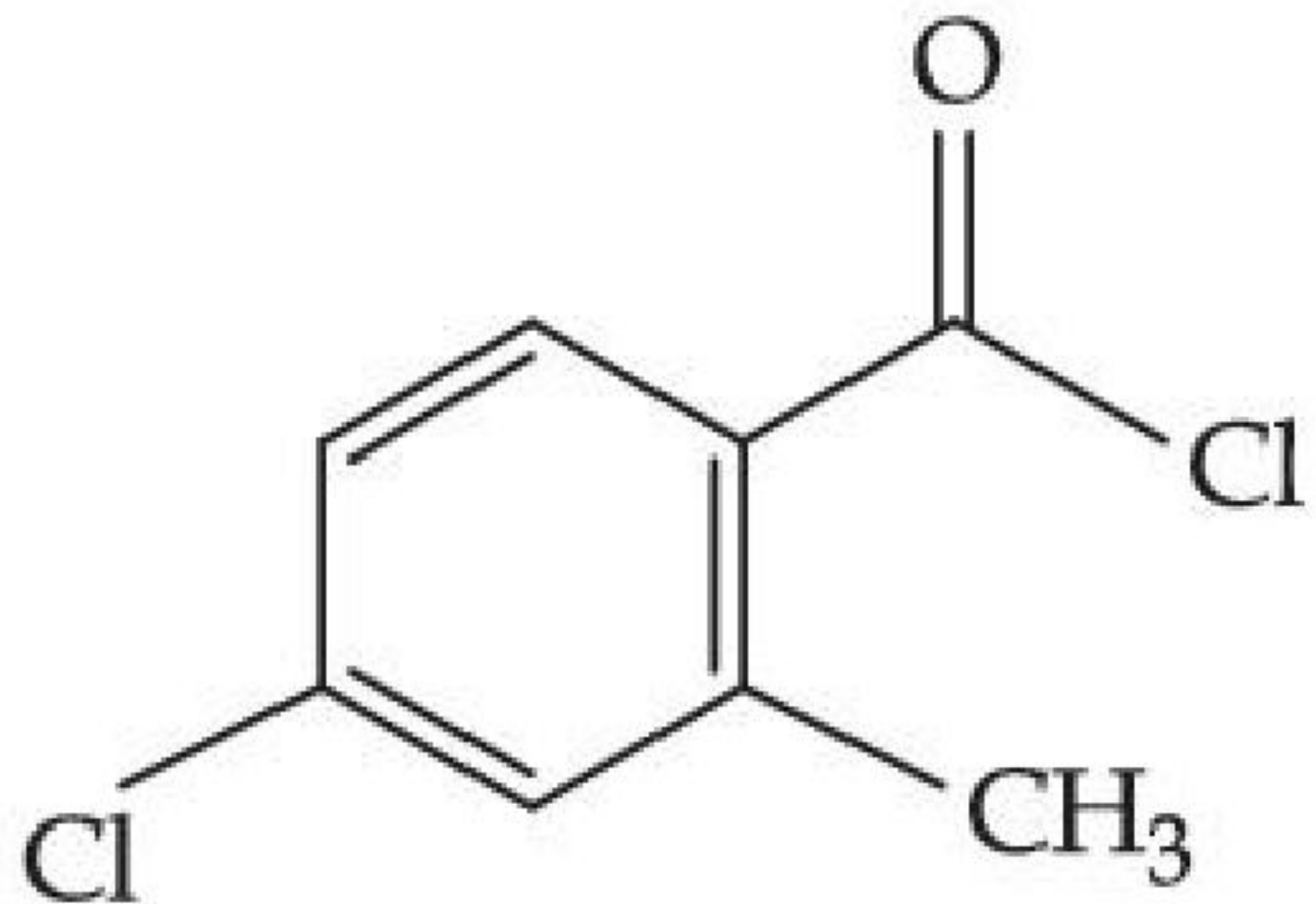
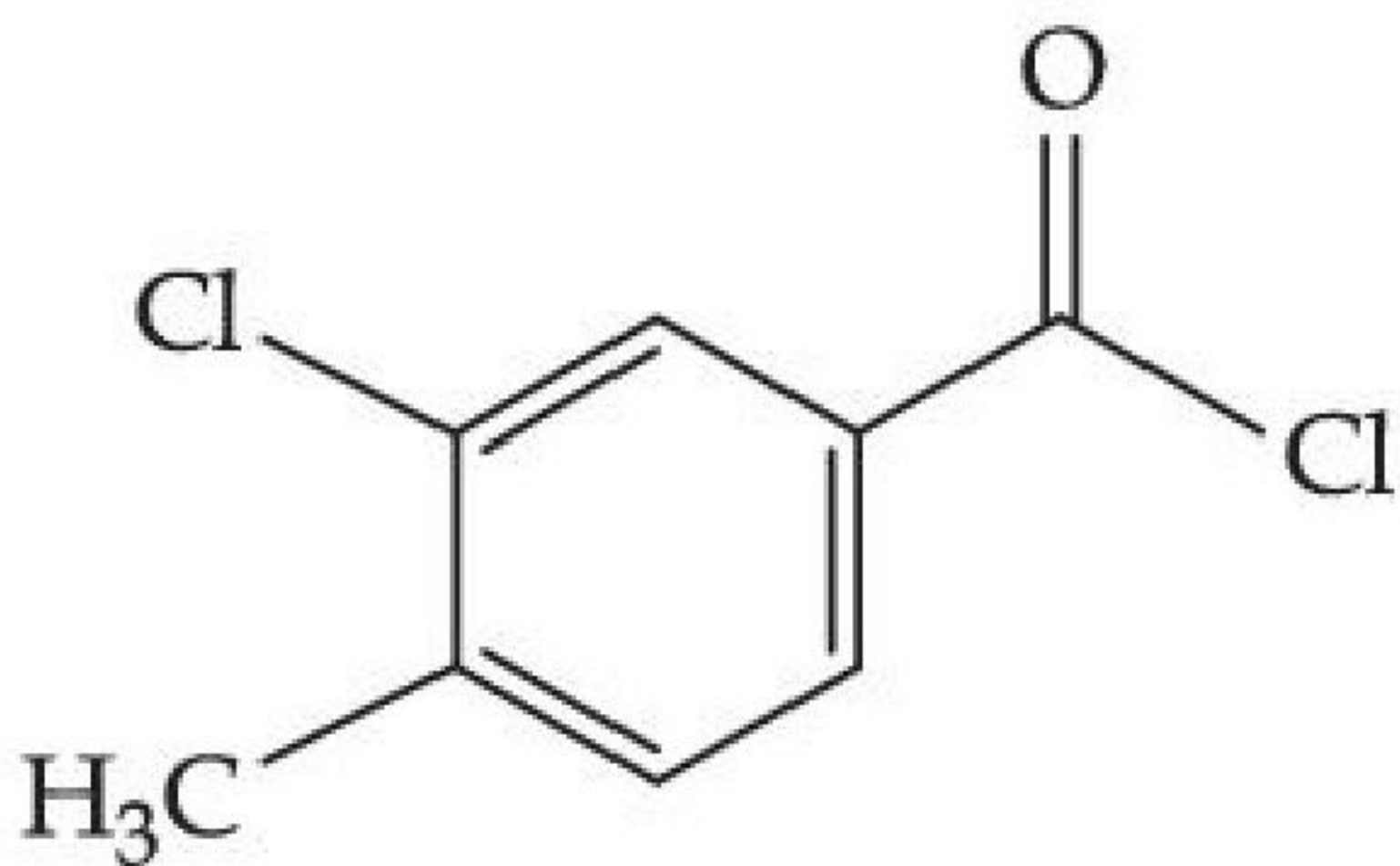
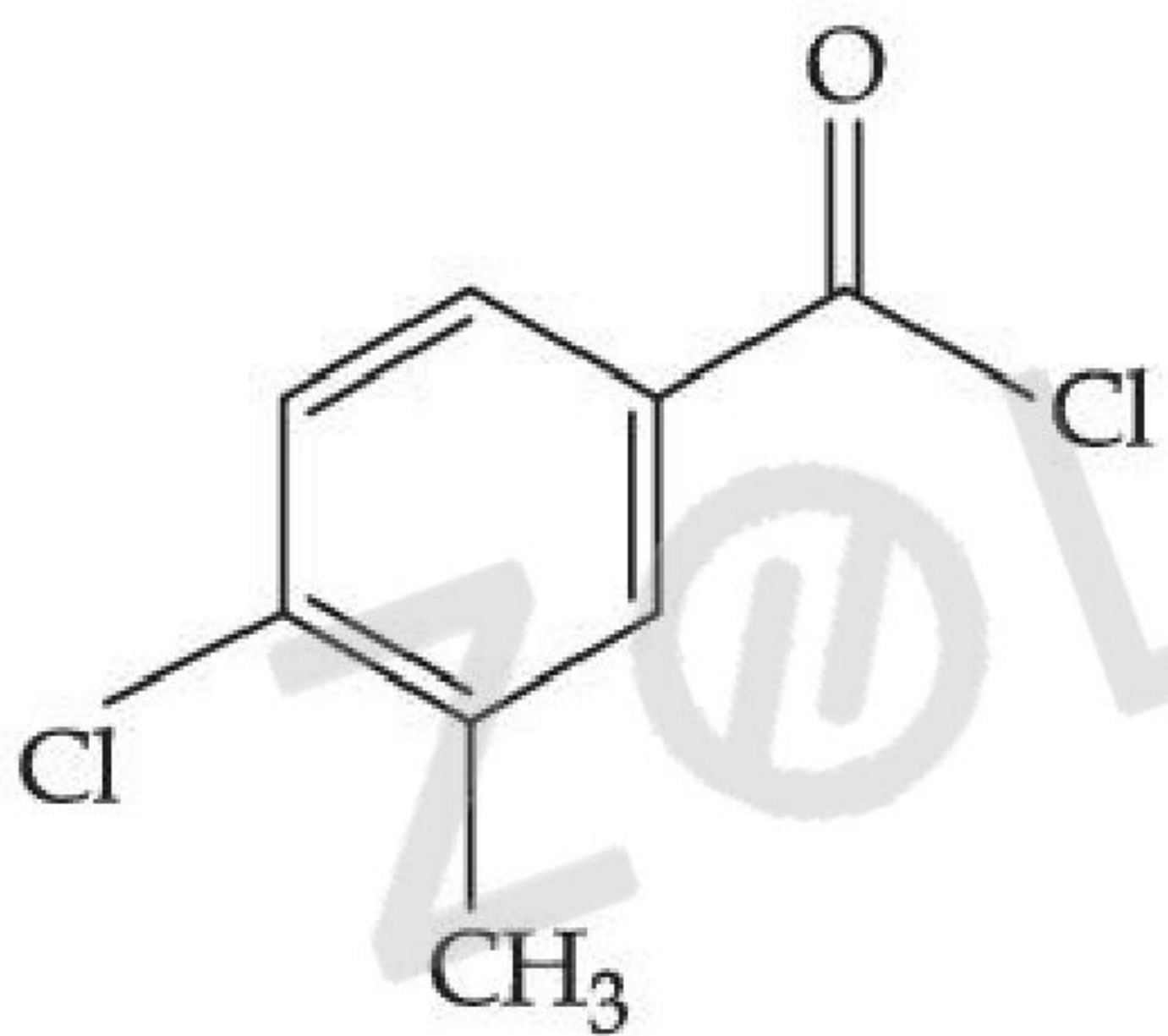
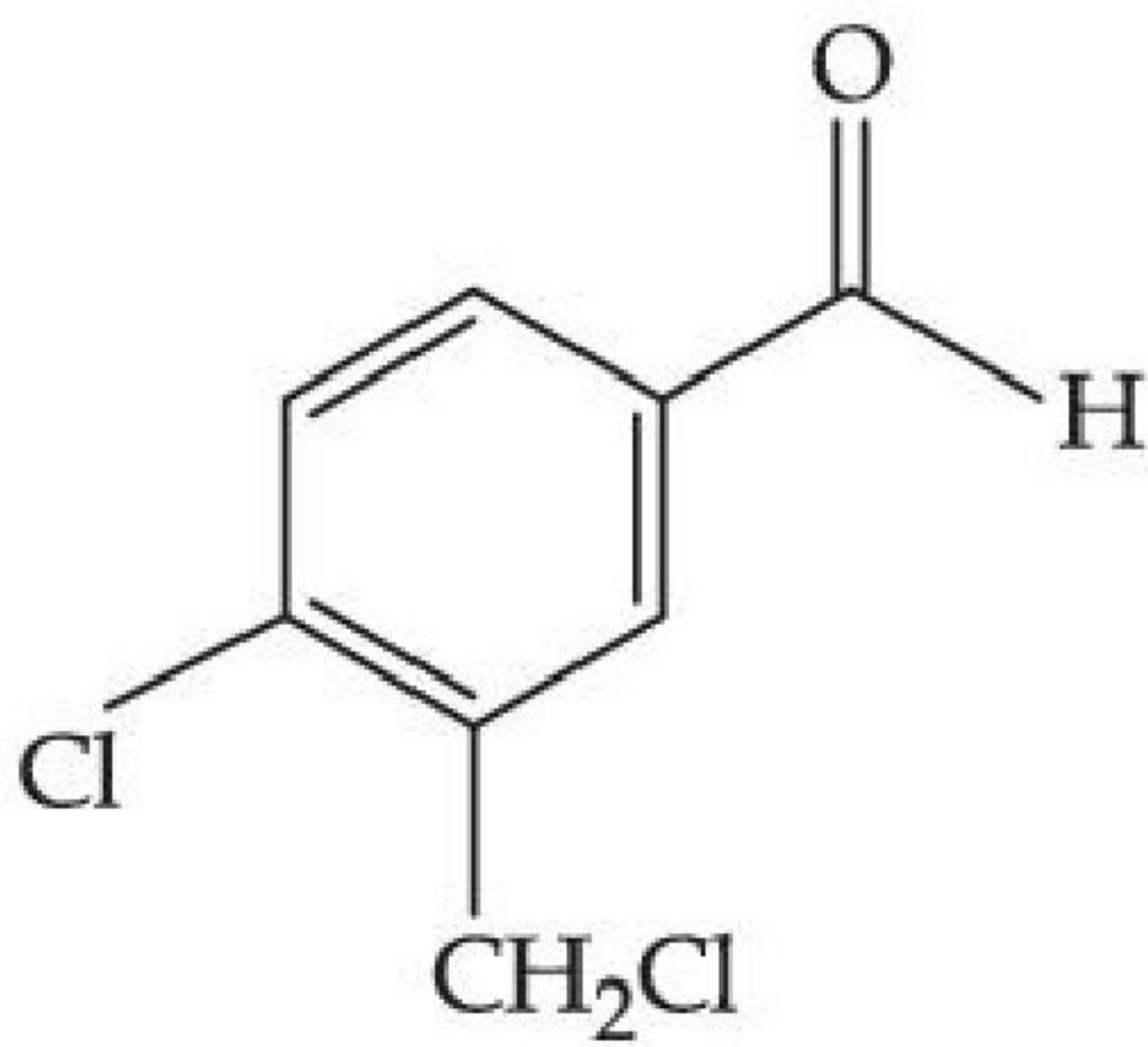
|                |                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                             |
| Item No:       | 75                                                                                                                                                              |
| Question ID:   | 100275                                                                                                                                                          |
| Question Type: | MCQ                                                                                                                                                             |
| Question:      | <p>  </p> <p>Consider the above reaction sequence, the Product 'C' is :</p> |
| A:             |                                                                              |



|    |                                                                                     |
|----|-------------------------------------------------------------------------------------|
| B: |    |
| C: |   |
| D: |  |

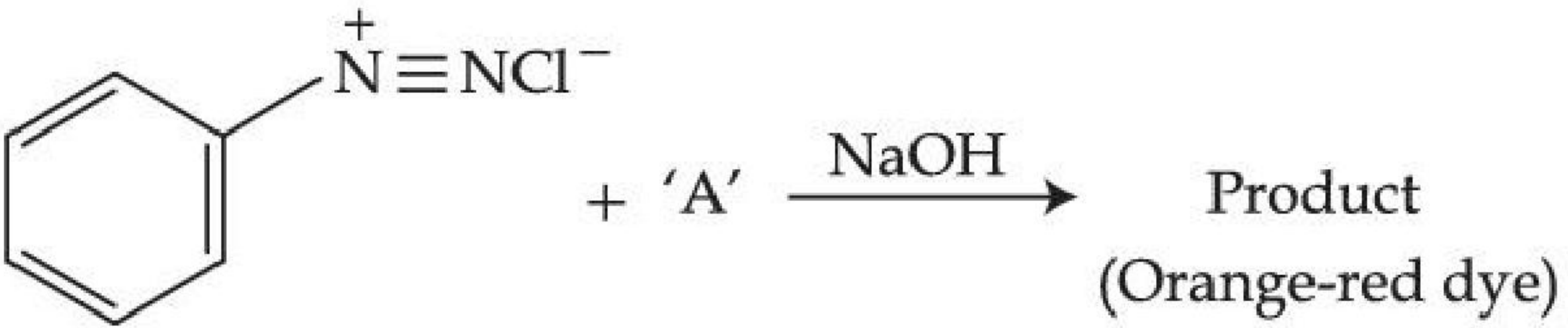
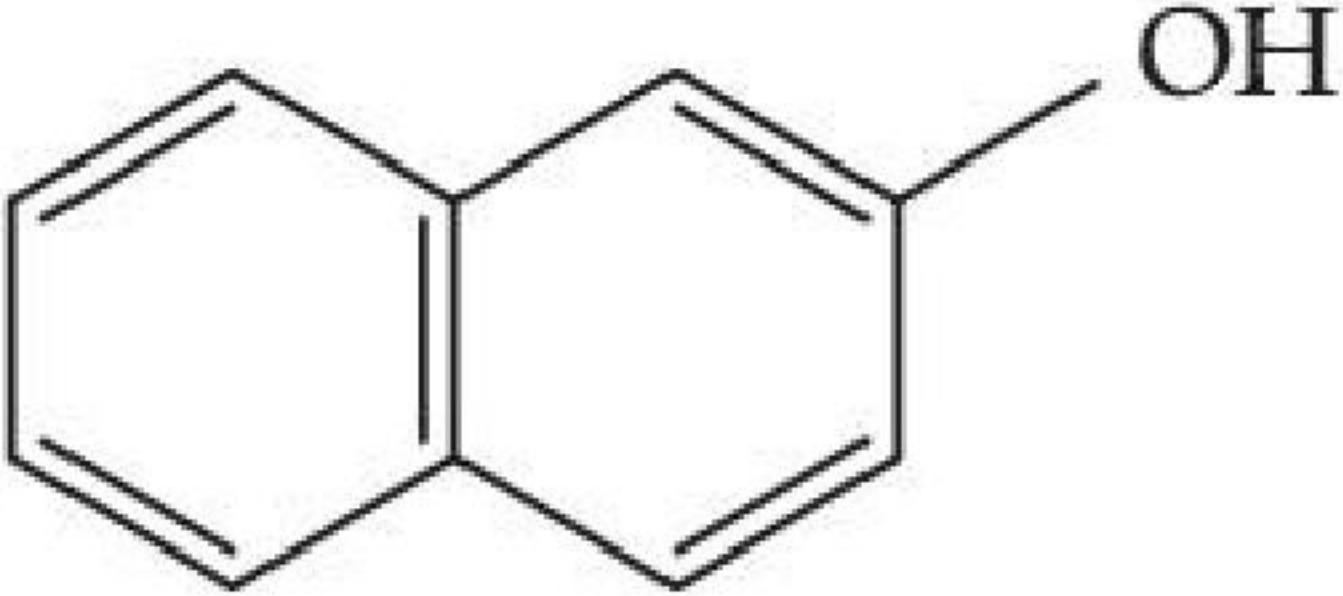
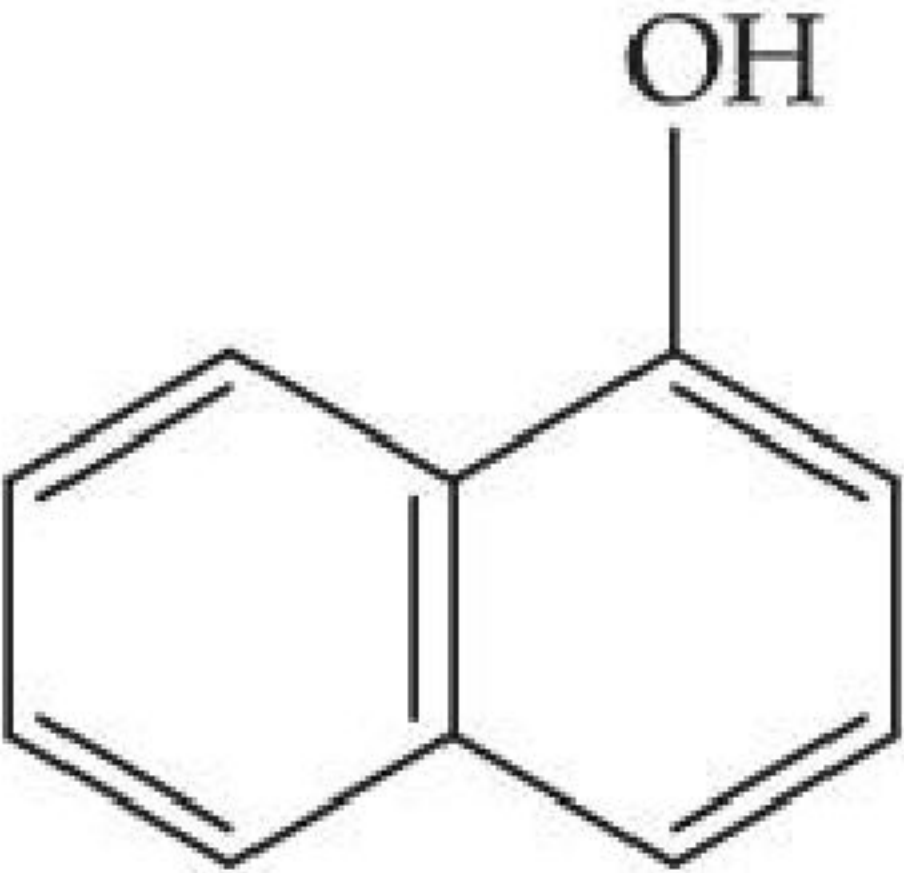
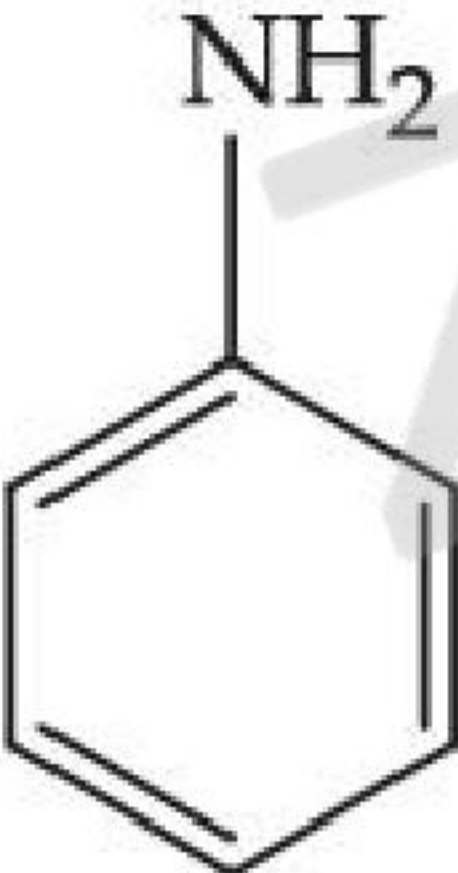
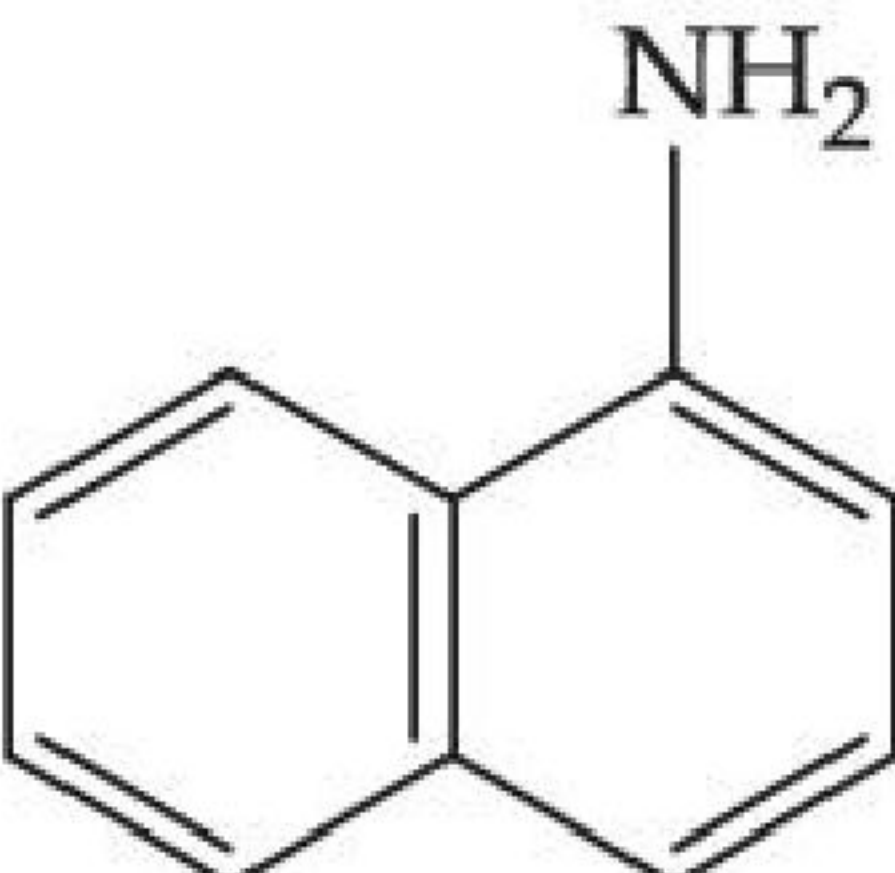
|                |                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                     |
| Item No:       | 76                                                                                                                                                      |
| Question ID:   | 100276                                                                                                                                                  |
| Question Type: | MCQ                                                                                                                                                     |
| Question:      | <p>  </p> <p>Consider the above reaction, the compound 'A' is :</p> |



|    |                                                                                     |
|----|-------------------------------------------------------------------------------------|
| A: |    |
| B: |   |
| C: |  |
| D: |  |

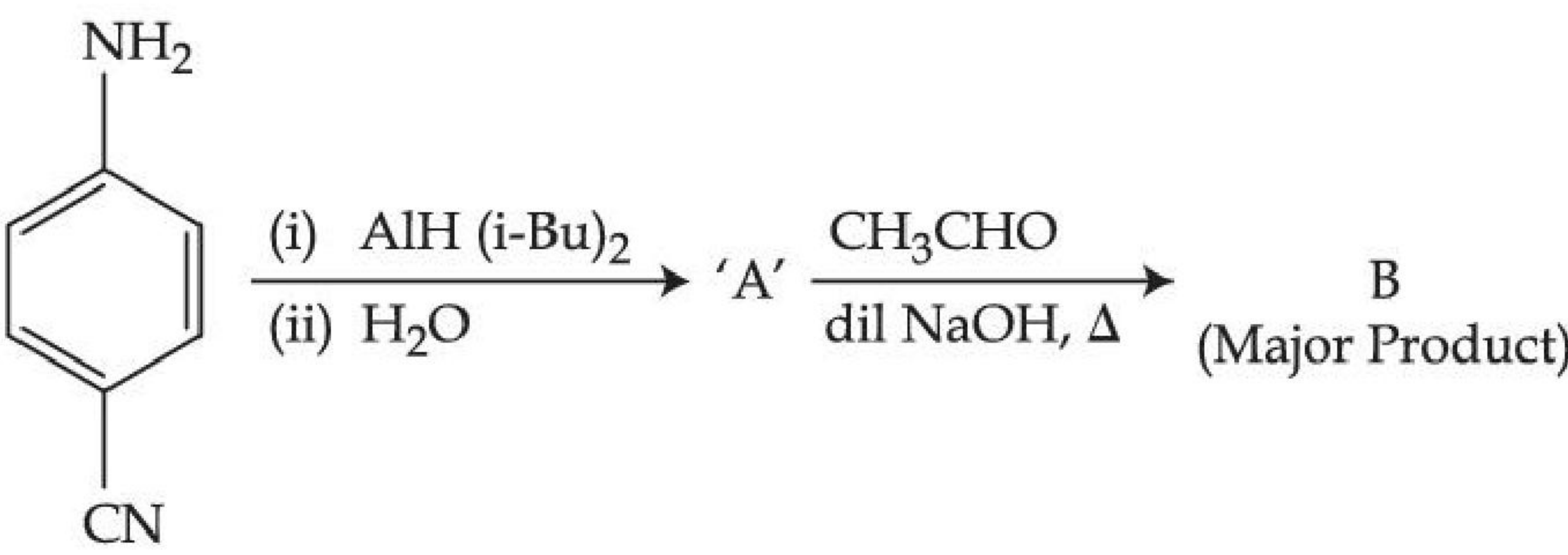
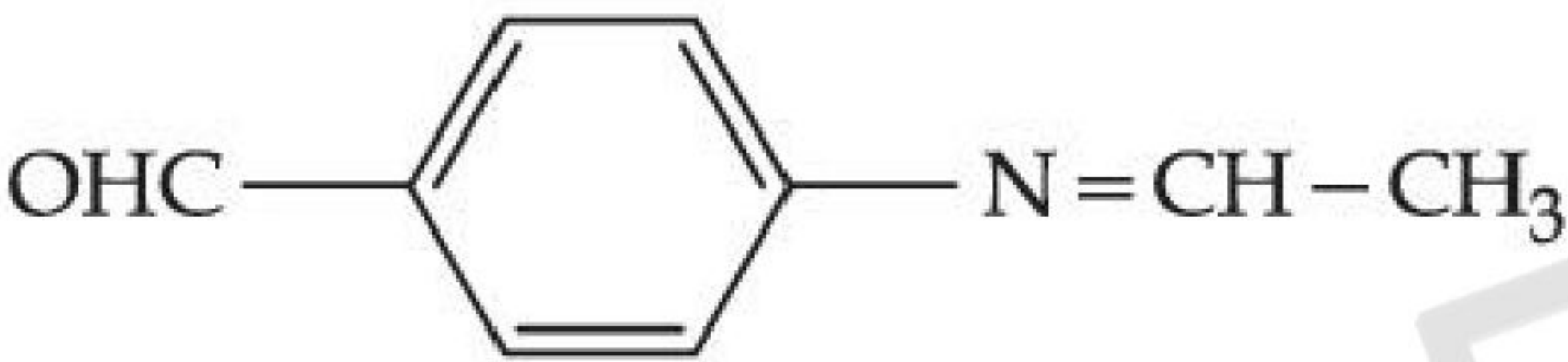
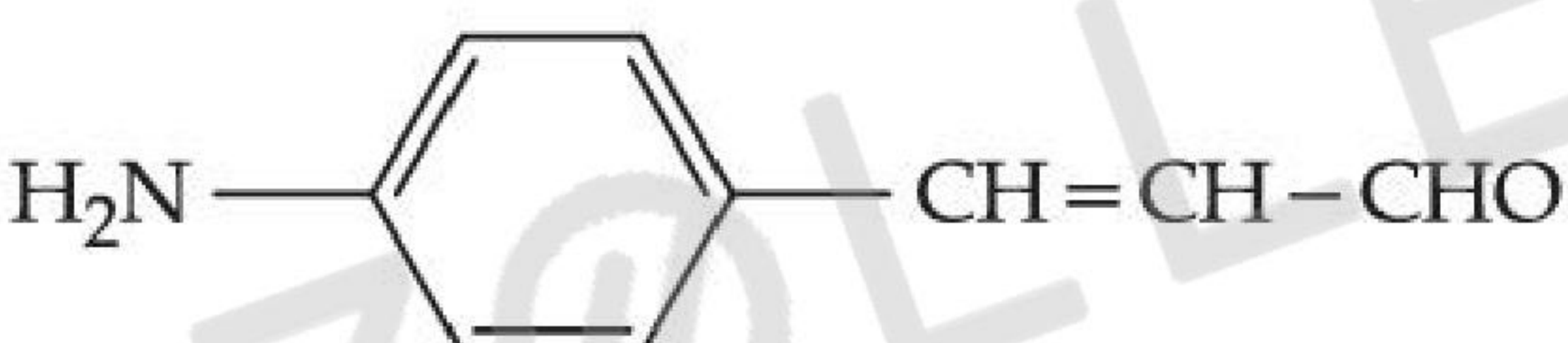
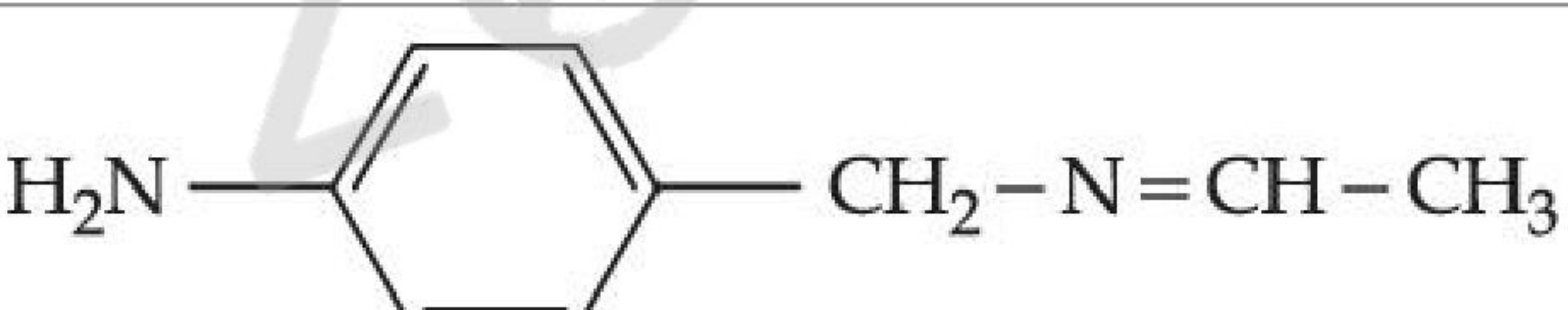
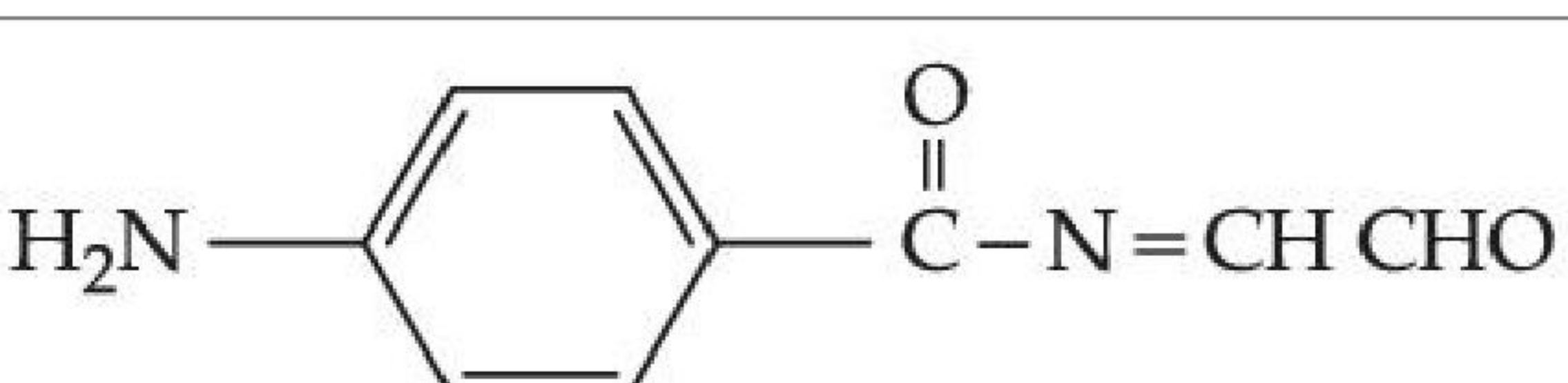
|                |                     |
|----------------|---------------------|
| Topic:         | Chemistry-Section A |
| Item No:       | 77                  |
| Question ID:   | <b>100277</b>       |
| Question Type: | MCQ                 |



|           |                                                                                                                                             |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Question: |  <p>Which among the following represent reagent 'A' ?</p> |
| A:        |                                                            |
| B:        |                                                          |
| C:        |                                                          |
| D:        |                                                          |

|                |                     |
|----------------|---------------------|
| Topic:         | Chemistry-Section A |
| Item No:       | 78                  |
| Question ID:   | <b>100278</b>       |
| Question Type: | MCQ                 |

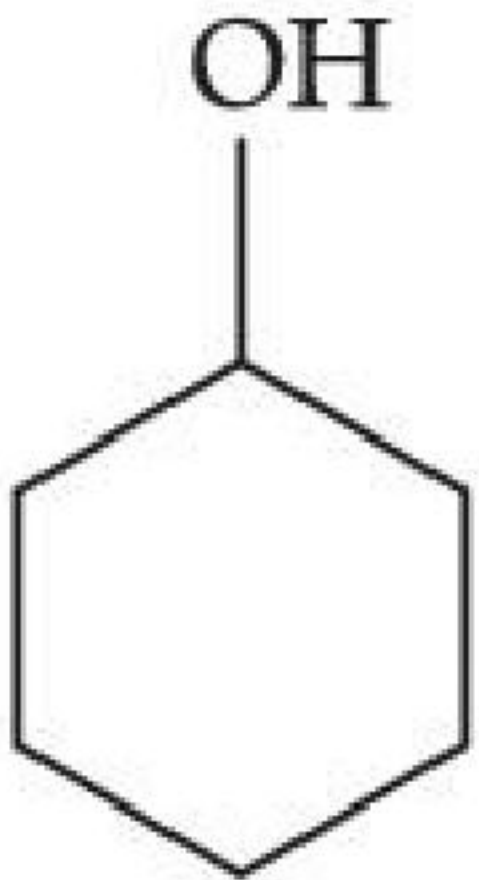
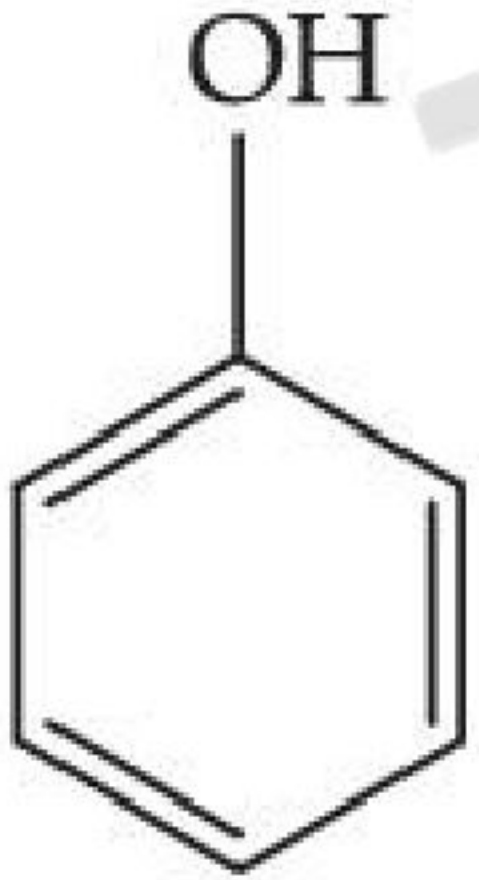
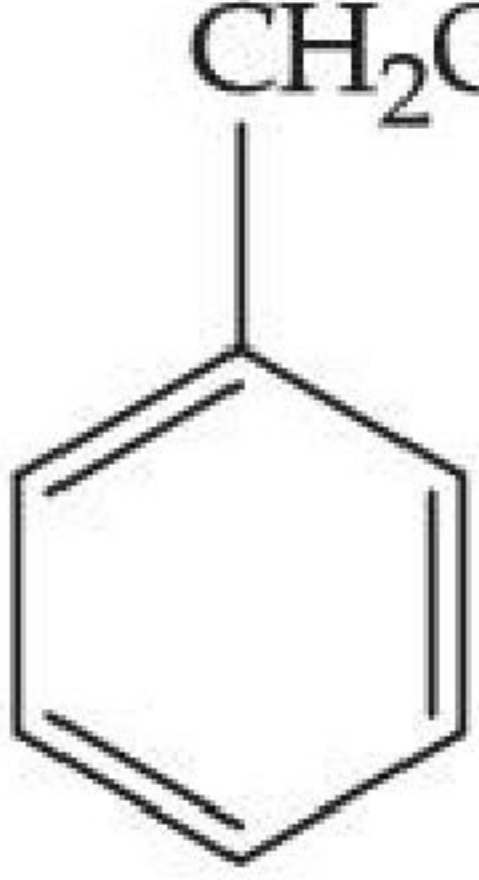
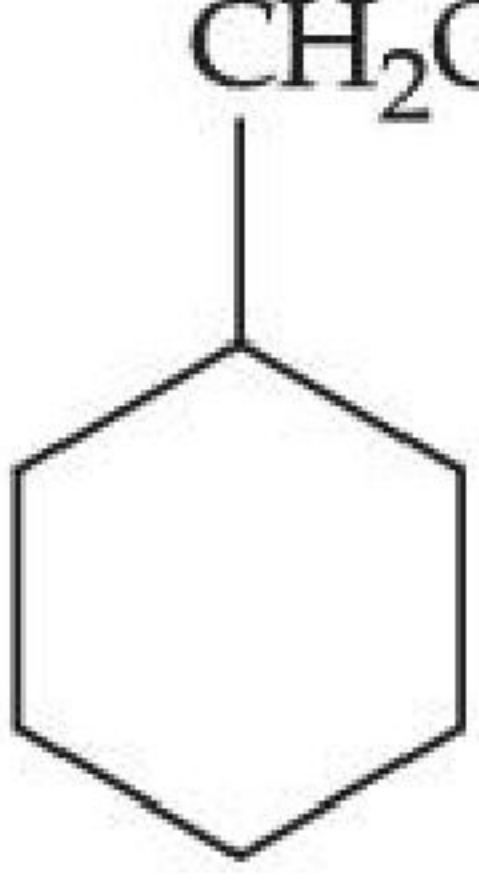


|           |                                                                                                                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | <p>Consider the following reaction sequence :</p> <div style="text-align: center;">  <p>The product 'B' is :</p> </div> |
| A:        |                                                                                                                       |
| B:        |                                                                                                                       |
| C:        |                                                                                                                       |
| D:        |                                                                                                                       |

|                |                                                                   |
|----------------|-------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                               |
| Item No:       | 79                                                                |
| Question ID:   | <b>100279</b>                                                     |
| Question Type: | MCQ                                                               |
| Question:      | Which of the following compounds is an example of hypnotic drug ? |
| A:             | Seldane                                                           |
| B:             | Amytal                                                            |



|    |           |
|----|-----------|
| C: | Aspartame |
| D: | Prontosil |

|                |                                                                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section A                                                                                                                                                                                             |
| Item No:       | 80                                                                                                                                                                                                              |
| Question ID:   | <b>100280</b>                                                                                                                                                                                                   |
| Question Type: | MCQ                                                                                                                                                                                                             |
| Question:      | A compound 'X' is acidic and it is soluble in NaOH solution, but insoluble in NaHCO <sub>3</sub> solution. Compound 'X' also gives violet colour with neutral FeCl <sub>3</sub> solution. The compound 'X' is : |
| A:             |                                                                                                                              |
| B:             |                                                                                                                              |
| C:             |                                                                                                                              |
| D:             |                                                                                                                              |



|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Item No:       | 81                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Question ID:   | <b>100281</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Question:      | <p>Resistance of a conductivity cell (cell constant <math>129 \text{ m}^{-1}</math>) filled with 74.5 ppm solution of KCl is <math>100 \Omega</math> (labelled as solution 1). When the same cell is filled with KCl solution of 149 ppm, the resistance is <math>50 \Omega</math> (labelled as solution 2). The ratio of molar conductivity of solution 1 and solution 2 is i.e. <math>\frac{\Lambda_1}{\Lambda_2} = x \times 10^{-3}</math>. The value of <math>x</math> is _____. (Nearest integer)</p> <p>Given, molar mass of KCl is <math>74.5 \text{ g mol}^{-1}</math>.</p> |

|                |                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                                                    |
| Item No:       | 82                                                                                                                                                                                                                                                                                                                                                                     |
| Question ID:   | <b>100282</b>                                                                                                                                                                                                                                                                                                                                                          |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                         |
| Question:      | <p>Ionic radii of cation <math>A^+</math> and anion <math>B^-</math> are 102 and 181 pm respectively. These ions are allowed to crystallize into an ionic solid. This crystal has cubic close packing for <math>B^-</math>. <math>A^+</math> is present in all octahedral voids. The edge length of the unit cell of the crystal AB is _____ pm. (Nearest Integer)</p> |

|                |                                                                                                                                                                                                                                                                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                                         |
| Item No:       | 83                                                                                                                                                                                                                                                                                                                                                          |
| Question ID:   | <b>100283</b>                                                                                                                                                                                                                                                                                                                                               |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                              |
| Question:      | <p>The minimum uncertainty in the speed of an electron in an one dimensional region of length <math>2a_0</math> (Where <math>a_0</math> = Bohr radius 52.9 pm) is _____ <math>\text{km s}^{-1}</math>.<br/>(Given : Mass of electron = <math>9.1 \times 10^{-31} \text{ kg}</math>, Planck's constant <math>h = 6.63 \times 10^{-34} \text{ Js}</math>)</p> |

|              |                     |
|--------------|---------------------|
| Topic:       | Chemistry-Section B |
| Item No:     | 84                  |
| Question ID: | <b>100284</b>       |



|                |                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                        |
| Question:      | <p>When 600 mL of 0.2 M <math>\text{HNO}_3</math> is mixed with 400 mL of 0.1 M NaOH solution in a flask, the rise in temperature of the flask is _____ <math>\times 10^{-2}^\circ\text{C}</math>.</p> <p>(Enthalpy of neutralisation = <math>57 \text{ kJ mol}^{-1}</math> and Specific heat of water = <math>4.2 \text{ JK}^{-1} \text{ g}^{-1}</math>)</p> <p>(Neglect heat capacity of flask)</p> |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Item No:       | 85                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Question ID:   | <b>100285</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Question:      | <p>If <math>\text{O}_2</math> gas is bubbled through water at 303 K, the number of millimoles of <math>\text{O}_2</math> gas that dissolve in 1 litre of water is _____. (Nearest Integer)</p> <p>(Given : Henry's Law constant for <math>\text{O}_2</math> at 303 K is 46.82 k bar and partial pressure of <math>\text{O}_2 = 0.920</math> bar)</p> <p>(Assume solubility of <math>\text{O}_2</math> in water is too small, nearly negligible)</p> |

|                |                                                                                                                                                                                                                                                                                          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                                      |
| Item No:       | 86                                                                                                                                                                                                                                                                                       |
| Question ID:   | <b>100286</b>                                                                                                                                                                                                                                                                            |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                                           |
| Question:      | <p>If the solubility product of PbS is <math>8 \times 10^{-28}</math>, then the solubility of PbS in pure water at 298 K is <math>x \times 10^{-16} \text{ mol L}^{-1}</math>. The value of <math>x</math> is _____. (Nearest Integer)</p> <p>[Given : <math>\sqrt{2} = 1.41</math>]</p> |

|                |                     |
|----------------|---------------------|
| Topic:         | Chemistry-Section B |
| Item No:       | 87                  |
| Question ID:   | <b>100287</b>       |
| Question Type: | Numeric Answer      |



|                                                                                                 |                                                                                                 |                                 |                                 |                                                                  |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------|------------------------------------------------------------------|
| Question:                                                                                       | The reaction between X and Y is first order with respect to X and zero order with respect to Y. |                                 |                                 |                                                                  |
|                                                                                                 | Experiment                                                                                      | $\frac{[X]}{\text{mol L}^{-1}}$ | $\frac{[Y]}{\text{mol L}^{-1}}$ | $\frac{\text{Initial rate}}{\text{mol L}^{-1} \text{ min}^{-1}}$ |
|                                                                                                 | I                                                                                               | 0.1                             | 0.1                             | $2 \times 10^{-3}$                                               |
|                                                                                                 | II                                                                                              | L                               | 0.2                             | $4 \times 10^{-3}$                                               |
|                                                                                                 | III                                                                                             | 0.4                             | 0.4                             | $M \times 10^{-3}$                                               |
|                                                                                                 | IV                                                                                              | 0.1                             | 0.2                             | $2 \times 10^{-3}$                                               |
| Examine the data of table and calculate ratio of numerical values of M and L. (Nearest Integer) |                                                                                                 |                                 |                                 |                                                                  |

|                |                                                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                              |
| Item No:       | 88                                                                                                                               |
| Question ID:   | <b>100288</b>                                                                                                                    |
| Question Type: | Numeric Answer                                                                                                                   |
| Question:      | In a linear tetrapeptide (Constituted with different amino acids), (number of amino acids) – (number of peptide bonds) is _____. |

|                |                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic:         | Chemistry-Section B                                                                                                                                                                                                                                                          |
| Item No:       | 89                                                                                                                                                                                                                                                                           |
| Question ID:   | <b>100289</b>                                                                                                                                                                                                                                                                |
| Question Type: | Numeric Answer                                                                                                                                                                                                                                                               |
| Question:      | In bromination of Propyne, with Bromine 1, 1, 2, 2-tetrabromopropane is obtained in 27% yield. The amount of 1, 1, 2, 2-tetrabromopropane obtained from 1 g of Bromine in this reaction is _____ $\times 10^{-1}$ g. (Nearest integer)<br>(Molar Mass : Bromine = 80 g/mol ) |

|                |                     |
|----------------|---------------------|
| Topic:         | Chemistry-Section B |
| Item No:       | 90                  |
| Question ID:   | <b>100290</b>       |
| Question Type: | Numeric Answer      |



|           |                                                                                                                                                                                                                    |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question: | $[\text{Fe}(\text{CN})_6]^{3-}$ should be an inner orbital complex. Ignoring the pairing energy, the value of crystal field stabilization energy for this complex is $(-)$ _____ $\Delta_o$ .<br>(Nearest integer) |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

ZOLLEGE.in