JEE Main 2025 Apr 4 Shift 2 Question Paper

Time Allowed :3 Hour	**Maximum Marks :**300	**Total Questions :**75

1. Maximum IE and minimum IE of group 13 elements are:

(1) B, In

(2) B, Tl

(3) Al, In

(4) Al, Tl

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2. Total number of electrons in chromium ($Z = 24$) for which the value of azimuthal quantum number (l) is 1 and 2.

(1) 10

(2) 12

(3) 14

(4) 16

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3. A disc is performing pure rolling if the speed of the top point is 8 m/s. Find the speed of point B.

(1) 2 m/s

(2) 4 m/s

(3) 6 m/s

(4) 8 m/s

4.

$$\cot^{-1}\left(\frac{7}{4}\right) + \cot^{-1}\left(\frac{19}{4}\right) + \cot^{-1}\left(\frac{39}{4}\right) + \ldots \infty$$

(1) $\cot^{-1}(2)$

(2) $\cot^{-1}\left(\frac{1}{2}\right)$

(3) $\cot^{-1}\left(\frac{1}{3}\right)$

(4) $\cot^{-1}(3)$

5.

$$\sum_{k=1}^{n}\left(\alpha^k + \frac{1}{\alpha^k}\right)^2 = 20, \quad \alpha \text{ is one of the roots of } x^2 + x + 1 = 0, \text{ then } n = ?$$

(1) 3

(2) 4

(3) 5

(4) 6

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6. x is a peptide which is hydrolyzed to 2 amino acids y and z. y when reacted with HNO_2 gives lactic acid. z when heated gives a cyclic structure as below:

$$\text{Cyclic structure:} \quad CH_2C \longrightarrow CNH_2$$
$$\text{Cyclic structure:} \quad NHC \quad C \longrightarrow O$$

2
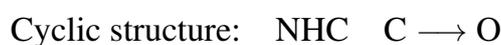
(1) Alanine and Lysine

(2) Alanine and Glycine

(3) Glycine and Alanine

(4) Valine and Glycine

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7. Let $L_1 : \frac{x-1}{3} = \frac{y}{4} = \frac{z}{5}$ and $L_2 : \frac{x-p}{2} = \frac{y}{3} = \frac{z}{4}$. If the shortest distance between L_1 and L_2 is $\frac{1}{\sqrt{6}}$, then the possible value of p is:

(1) 3

(2) 2

(3) 5

(4) 7

8.
$$\int_9^{10} \frac{\sqrt{1+x^2+x}}{\sqrt{1+x^2-x}} \, dx = \frac{1}{m} \left[\left(\sqrt{1+x^2+x} + x\right)^n \left(n\sqrt{1+x^2-x} - x\right) \right] + c$$
where c is the constant of integration and $m, n \in \mathbb{N}$, then $m + n$ is

(1) 3

(2) 4

(3) 5

(4) 6

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9. A particle of mass m is at a distance $3R$ from the center of Earth. Find the minimum kinetic energy of the particle to leave Earth's field, where R is the radius of Earth.

(1) $\frac{mgR}{3}$

(2) $3mgR$

(3) $\frac{2}{3}mgR$

(4) $\frac{mgR}{2}$

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10. Let the mean and variance of the observations $2, 3, 3, 4, 5, 7, a, b$ be 4 and 2, respectively. Then, the mean deviation about the mode of the observation is:

(1) 2

(2) 3

(3) 4

(4) 5

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11. In a YDSE setup, the slits are separated by 1.5 mm and the distance between the slits and the screen is 2 m. On using light of wavelength 400 nm, it is observed that 20 maxima of double slit experiment lie inside the central maxima of single slit diffraction. The width of each slit is m.

(1) 0.5 m

(2) 1 m

(3) 2 m

(4) 3 m

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12. Maximum IE and minimum IE of group 13 elements are:

(1) B, In

(2) B, Tl

(3) Al, In

(4) Al, Tl

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13. Statement-1: Alcohol is prepared from alkyl halide in the presence of aqueous KOH by elimination.

Statement-2: Alkenes are prepared from alkyl halide with alcoholic KOH by β-elimination.

Which of the following options is correct? 1. Statement-1 and Statement-2 are correct.

2. Statement-1 and Statement-2 are incorrect.

3. Statement-1 is true and Statement-2 is false.

4. Statement-1 is false and Statement-2 is true.

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14. Statement-1: ClF_3 has 3 possible structures.

Statement-2: III is the most stable structure due to least lone pair-bond pair (lp-bp) repulsion.

(I)   (II)   (III)
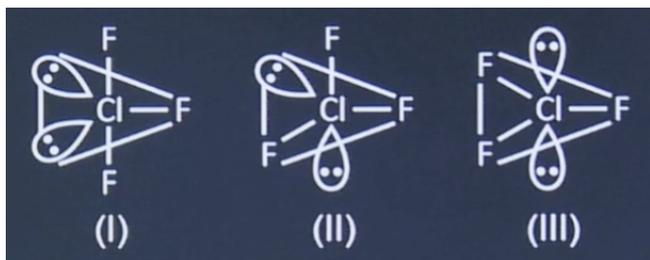
Which of the following options is correct?

(1) Statement-1 is correct and Statement-2 is incorrect.

(2) Statement-1 is incorrect and Statement-2 is correct.

(3) Both Statement-1 and Statement-2 are correct.

(4) Both Statement-1 and Statement-2 are incorrect.

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15. Consider the following graph between Rate Constant (K) and $\frac{1}{T}$: Based on the graph, determine the correct order of activation energies E_{a1}, E_{a2}, and E_{a3}.
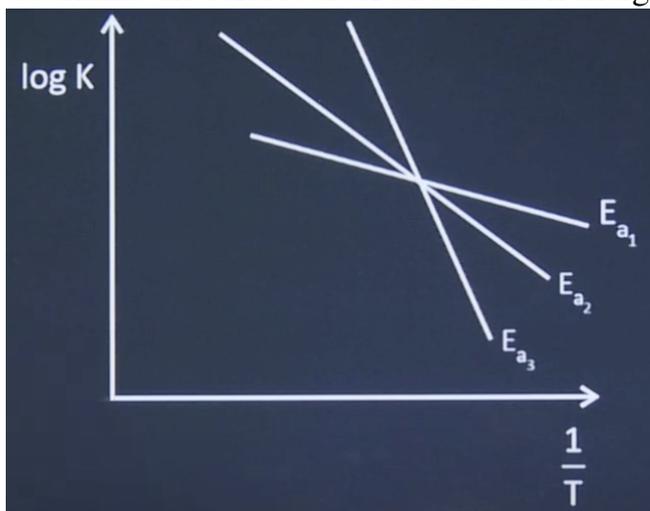
(1) $E_{a1} > E_{a2} > E_{a3}$

(2) $E_{a3} > E_{a2} > E_{a1}$

(3) $E_{a1} > E_{a3} > E_{a2}$

(4) $E_{a1} > E_{a2} > E_{a4}$