JEE Main 2025 Apr 3 Shift 2 Question Paper with Solutions

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

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 75 questions. The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 25 questions in each part of equal weightage.
4. Each part (subject) has two sections.
   (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each question carries 4 marks for correct answer and –1 mark for wrong answer.
   (ii) Section-B: This section contains 5 questions. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

1. If $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}} = p$**, then** $96\ln p$ **is:**

(1) 19117

(2) 18817

(3) 18280

(4) 19000

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2. The ratio of intensities of two coherent sources is 1:9. The ratio of the maximum to the minimum intensities is:

(1) 9:1

(2) 16:1

(3) 8:1

(4) 4:1

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3. Let $A = \{-3, -2, -1, 0, 1, 2, 3\}$. A relation R is defined such that xRy iff $y = \max(x, 1)$. The number of elements required to make it reflexive is l, the number of elements required to make it symmetric is m, and the number of elements in the relation R is n. Then the value of $l + m + n$ is equal to:

(1) 7

(2) 8

(3) 9

(4) 10

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4. Find out magnitude of work done in the process ABCD (in kJ).

(1) 10

(2) 12

(3) 14

(4) 16

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5. Let a circle C with radius r passes through four distinct points $(0, 0), (k, 3k), (2, 3), (-1, 5)$, such that $k \neq 0$, then $(10k + 2r^2)$ is equal to:

(1) 35

(2) 34

(3) 27

(4) 32

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6. In a resonance tube experiment at one end, resonance is obtained at two consecutive lengths $l_1 = 100$ cm and $l_2 = 140$ cm. If the frequency of the sound is 400 Hz, the velocity of sound is:

(1) 320 m/s

(2) 340 m/s

(3) 380 m/s

(4) 300 m/s

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7. Amount of magnesium (Mg) (in mg) required to liberate 224 mL of H_2 gas at STP, when reacted with HCl.

(1) 20

(2) 10

(3) 15

(4) 5

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8. Among Sc, Ti, Mn and Co, calculate the spin-only magnetic moment in the $+2$ oxidation state of the metal having the highest heat of atomisation.

(1) 4.9 B.M.

(2) 5.9 B.M.

(3) 2.9 B.M.

(4) 3.9 B.M.

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9. Evaluate the integral $I = \int_0^{\pi} \frac{4\cos^2 x + \sin^2 x}{8x}\, dx$.

(1) π^2

(2) $4\pi^2$

(3) $2\pi^2$

(4) $\frac{3}{2}\pi^2$

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10. The distance of the point $(7, 10, 11)$ from the line $\frac{x-9}{2} = \frac{y-13}{3} = \frac{z-17}{6}$ along the line is:

(1) $\frac{1}{\sqrt{14}}$

(2) $\frac{2}{\sqrt{14}}$

(3) $\frac{3}{\sqrt{14}}$

(4) $\frac{4}{\sqrt{14}}$

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11. The ratio of intensities of two coherent sources is 1:9. The ratio of the maximum to the minimum intensities is:

(1) 9:1

(2) 16:1

(3) 8:1

(4) 4:1

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12. Statement 1: Hyper conjugation is not a permanent effect

Statement 2: In general, greater the number of Alkyl groups attached to a positively charged carbon atom, greater is the Hyper conjugation interaction and stabilization of the cation.

(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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13. At 715 mm pressure, 300 K, volume of N_2 (g) evolved was 80 mL by a 0.4 g sample of organic compound. Find the percentage of N in the organic compound. Given aqueous tension at 300 K = 15 mm.

(1) 20.95

(2) 25.85

(3) 30.25

(4) 15.83

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14. Fat soluble vitamin is:

(A) Vitamin B_1

(B) Vitamin C

(C) Vitamin B_{12}

(D) Vitamin K

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15. Let $y = f(x)$ be the solution of the differential equation

$$\frac{dy}{dx} + 3y\tan^2 x + 3y = \sec^2 x$$

such that $f(0) = \frac{e^3}{3} + 1$, then $f\left(\frac{\pi}{4}\right)$ is equal to:

(1) $1 + e^3$

(2) $\frac{2}{3}\left(1 + \frac{1}{e^3}\right)$

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

(4) $\frac{1}{3}\left(1 + \frac{1}{e^3}\right)$

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16. The mass of magnesium required to produce 220 mL of hydrogen gas at STP on reaction with excess of dilute HCl is: (Given molar mass of Mg = 24 g/mol)

(1) 0.44 g

(2) 0.22 g

(3) 0.88 g

(4) 1.32 g

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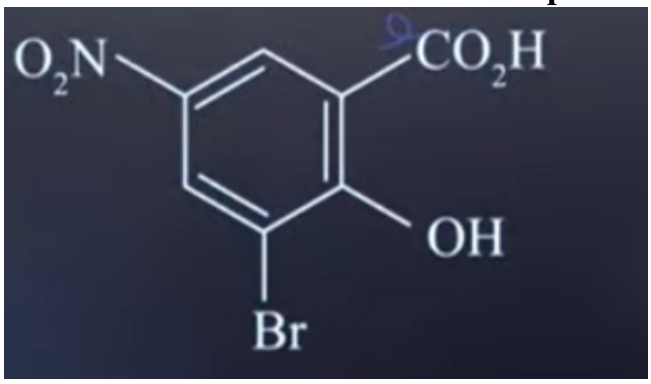
17. Find the IUPAC name of the compound.



(1) 3-Bromo-2-nitrobenzoic acid

(2) 2-Bromo-3-nitrobenzoic acid

(3) 4-Bromo-3-nitrobenzoic acid

(4) 3-Bromo-4-nitrobenzoic acid

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18. Area bounded by $|x - y| \le y \le 4\sqrt{x}$ is equal to (in square units):

(1) $\frac{2048}{3}$

(2) $\frac{1024}{3}$

(3) $\frac{512}{3}$

(4) $\frac{128}{3}$

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19. If $(1+x+x^2)^{10} = 1 + a_1x + a_2x^2 + \ldots$, **then** $(a_1 + a_3 + a_5 + \cdots + a_{19}) - 11a_2$ **equals to:**

(1) 0

(2) 10

(3) 20

(4) 30

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20. The integral

$$\int_0^{\pi} \frac{8x}{4\cos^2 x + \sin^2 x}\, dx$$ is equal to:

(a) $2\pi^2$

(b) π^2

(c) $\frac{3\pi^2}{2}$

(d) $4\pi^2$
