KEAM 2025 April 23 Question Paper

Time Allowed :3 Hours	Maximum Marks : 600	Total Questions :150

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper comprises 150 questions.

2. The Paper is divided into three parts- Maths, Physics and Chemistry.

3. There are 45 questions in Physics, 30 questions in Chemistry and 75 questions in Mathematics.

4. For each correct response, candidates are awarded 4 marks, and for each incorrect response, 1 mark is deducted.

1. Evaluate the integral:

$$\int \frac{2x^2 + 4x + 3}{x^2 + x + 1} \, dx$$

(A) $\frac{2}{3}x^3 + 2x + C$

(B) $\frac{1}{3}x^3 + 3x + C$

(C) $\frac{1}{3}x^3 + x + C$

(D) $\frac{2}{3}x^3 + 3x + C$

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2. Solve for a and b given the equations:

$$\sin x + \sin y = a, \quad \cos x + \cos y = b, \quad x + y = \frac{2\pi}{3}$$

(A) $a = \frac{1}{2}, \quad b = \frac{1}{2}$

(B) $a = \frac{1}{2}, \quad b = \frac{1}{\sqrt{2}}$

(C) $a = 0, \quad b = 1$

(D) $a = 1, \quad b = 1$

---

3. Find the domain of the composite function $f \circ g(x)$ where $f(x) = \log(5x)$ and

$g(x) = \cos(x)$**.**

(A) $\left[0, \frac{\pi}{2}\right]$

(B) $(-\infty, \infty)$

(C) $(0, \infty)$

(D) $\left(\cos^{-1}\left(\frac{1}{5}\right), \infty\right)$

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4. Given the function $h(x) = f(g(x))$, where $f(x) = f'(x) = 3$, and $g(x) = 9$, find $g'(3)$,

$f'(3)$**, and $h'(3)$.**

(A) $g'(3) = 6, \quad f'(3) = 9, \quad h'(3) = 3$

(B) $g'(3) = 9, \quad f'(3) = 6, \quad h'(3) = 6$

(C) $g'(3) = 3, \quad f'(3) = 9, \quad h'(3) = 9$

(D) $g'(3) = 9, \quad f'(3) = 6, \quad h'(3) = 9$

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5. If $-5 < x \le -1$**, then** $-21 \le 5x + 4 \le b$**. Find** b**.**

(A) $b = -11$

(B) $b = -16$

(C) $b = -12$

(D) $b = -13$

---

6. An unbiased die is tossed until a sum S **is obtained. If** X **denotes the number of times tossed, find the ratio** $\frac{P(X=2)}{P(X=5)}$**.**

(A) $\frac{1}{4}$

(B) $\frac{1}{2}$

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

(D) $\frac{1}{5}$

---

7. Evaluate the integral:

$$\int e^x \sec(x)\, (\tan(x) + 1)\ dx$$

(A) $e^x \sec(x) + C$

(B) $e^x \sec(x)\, (\tan(x) + 1) + C$

(C) $e^x \sec(x) \tan(x) + C$

(D) $e^x \sec(x) \tan(x) + e^x \sec(x) + C$

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8. Given that $\vec{a} \parallel \vec{b}$**,** $\vec{a} \cdot \vec{b} = \frac{49}{2}$**, and** $|\vec{a}| = 7$**, find** $|\vec{b}|$**.**

(A) $|\vec{b}| = 7$

(B) $|\vec{b}| = 14$

(C) $|\vec{b}| = \frac{49}{7}$

(D) $|\vec{b}| = \frac{49}{14}$

---

9. If $f(x) = \sqrt{x-3} + 4\sqrt{5-x}$**, find the domain of** $f(x)$**.**

(A) $[3, 5]$

(B) $[3, 5)$

(C) $(3, 5]$

(D) $(3, 5)$

---

10. Given the function $F(x) = |\sin(3x)| - \cos(3x)$**, for** $\frac{\pi}{6} \le x \le \frac{\pi}{3}$**, find** $f'\left(\frac{\pi}{4}\right)$**.**

(A) $-\frac{3}{2}$

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

(C) $-\frac{1}{2}$

(D) $\frac{1}{2}$

---

11. If $f(x) = \cos x$**, find the following expression:**

$$\frac{1}{2}\left[f(x+y) + f(y-x) - f(x) \cdot f(y)\right]$$

(A) $\cos(x+y) + \cos(y-x) - \cos x \cdot \cos y$

(B) $\cos(x+y) - \cos(y-x) - \cos x \cdot \cos y$

(C) $2\cos(x+y) - \cos x \cdot \cos y$

(D) $\cos(x+y) + \cos(y-x) + \cos x \cdot \cos y$

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12. Given:

$$\sum_{k=0}^{5} \binom{10}{2k} = \alpha \quad \text{and} \quad \sum_{k=0}^{4} \binom{10}{2k+1} = \beta$$

Find the value of $\alpha - \beta$.

(A) 0

(B) 1

(C) 2

(D) 3

---

13. Given the line equation $Ax + By + C = 0$**, which passes through the point** $(-10, 7)$ **and is perpendicular to the line** $11x - 8y - 16 = 0$**, find** C**.**

(A) $C = -26$

(B) $C = 28$

4

(C) $C = -24$

(D) $C = 16$

---

14. Given the following information:

$$n(A \times B) = 160, \quad n(B \times C) = 80, \quad n(A \times C) = 240$$

Find $n(A)$.

(A) $n(A) = 16$

(B) $n(A) = 20$

(C) $n(A) = 24$

(D) $n(A) = 30$

---

15. Find the equation of the circle touching the x-axis at $(9, 0)$ and the line $y = 14$.

(A) $(x - 9)^2 + y^2 = 14^2$

(B) $(x - 9)^2 + (y - 7)^2 = 7^2$

(C) $(x + 9)^2 + (y - 14)^2 = 14^2$

(D) $(x - 9)^2 + (y - 7)^2 = 14^2$

---

16. Evaluate the limit:

$$\lim_{x \to \infty} \frac{\sqrt{\cos^2 x + 3} - \sqrt{\cos^2 x + \sin x + 3}}{x}$$

(A) 0

(B) 1

(C) -1

(D) Undefined

---

17. The velocity is given as $\mathbf{v} = 3\hat{i} + 3\hat{j}$. Find the acceleration a.

(A) $\mathbf{a} = 3\hat{i} + 3\hat{j}$

(B) $\mathbf{a} = 0$

(C) $\mathbf{a} = 6\hat{i} + 6\hat{j}$

(D) $\mathbf{a} = 3\hat{i} + 6\hat{j}$

---

18. If $\sin \alpha = \frac{12}{13}$, **and** $\frac{\pi}{6} \leq \alpha \leq \frac{3\pi}{2}$, **find** $\tan \alpha$.

(A) $\frac{5}{12}$

(B) $\frac{5}{13}$

(C) $\frac{12}{5}$

(D) $\frac{13}{5}$

---

19. Find $\tan 15° + \tan 45°$.

(A) $1 + \tan 15°$

(B) $\tan 60°$

(C) $\tan 60° + 1$

(D) $\tan 15° + 1$

---

20. Evaluate the integral:

$$\int_{\frac{\pi}{10}}^{\frac{2\pi}{5}} \frac{\cot^3 x}{1 + \cot^3 x} \, dx$$

(A) $\frac{1}{2}$

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

(C) 0

(D) $\frac{1}{4}$

---

21. Evaluate the integral:

$$\int \frac{\sin^1 x}{\sqrt{1 - x^2}} \, dx$$

(A) $\frac{1}{2}$

(B) $\frac{\sin^2 x}{2}$

(C) $\frac{\cos^2 x}{2}$

(D) $\frac{\sin x}{2}$

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22. Given that $|\mathbf{a}+\mathbf{b}| = \frac{\sqrt{14}}{2}$, where $\mathbf{a}$ and $\mathbf{b}$ are unit vectors, find the value of $|\mathbf{a}+\mathbf{b}|^2 - |\mathbf{a}-\mathbf{b}|^2$.

(A) 7

(B) 4

(C) 14

(D) 3

---

23. Find the focus of the parabola $x^2 - 4x + 8y + 4 = 0$.

(A) $(2,1)$

(B) $(1,2)$

(C) $(-2,1)$

(D) $(2,-1)$

---

24. Given the system of equations:

$$Z + \bar{Z} = 4 \quad \text{and} \quad Z - \bar{Z} = 6$$

Find $|Z|$.

(A) 13

(B) 7

(C) 10

(D) 6

---

25. A planet revolves around the sun with a time period 27 times that of planet B. Planet A is at x times the distance of planet B from the sun. Find the value of x.

(A) 13

(B) 12

(C) 10

(D) 15

7

26. Relations between the speed of X-ray, gamma-ray, and UV rays when they travel in a vacuum.

(A) X-rays travel faster than UV rays and gamma rays.

(B) Gamma-rays travel faster than UV rays and X-rays.

(C) UV rays travel faster than X-rays and gamma rays.

(D) All of them travel at the same speed.

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27. If the frequency of the cyclotron is doubled, then the radius becomes?

(A) Doubled

(B) Halved

(C) Quadrupled

(D) Unchanged

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28. Electrostatic force is maximum when charge Q is placed at ——?

(A) At the center of the sphere

(B) At the surface of the sphere

(C) At the corner of the cube

(D) At infinity

---

29. In an equilateral triangle with each side having resistance R, what is the effective resistance between two sides?

(A) $\frac{R}{3}$

(B) $\frac{2R}{3}$

(C) R

(D) $\frac{R}{2}$

---

30. A cylindrical vessel contains 16 kg at 1 atm. A certain amount of substance is taken out so that pressure becomes 0.7 atm. Find the amount taken out (in kg).

(A) 2.5 kg

(B) 3.5 kg

(C) 4 kg

(D) 5 kg

---

31. What phenomenon is explained by the wave nature of electromagnetic radiation?

(A) Diffraction

(B) Reflection

(C) Refraction

(D) Polarization

---

32. Fehling's solution is a mixture of:

(A) Copper sulfate and sodium hydroxide

(B) Sodium hydroxide and potassium cyanide

(C) Copper sulfate and potassium cyanide

(D) Copper sulfate and sodium tartrate

---

33. Which of the following is the set of neutral oxides? a) Al_2O_3, Cl_2O_7, b) N_2O, CO

(A) Al_2O_3, Cl_2O_7

(B) N_2O, CO

(C) N_2O, SO_2

(D) SO_2, CO_2

---

34. Initial concentration of a reaction is 1.68×10^{-2} and after 10 minutes concentration becomes 0.84×10^{-2}. Then the rate of concentration in minutes is:

(A) 0.084

(B) 0.042

(C) 0.014

(D) 0.021

---

35. Number of sigma and pi bonds in methyl but-1-ene is:

(A) 10 sigma bonds and 3 pi bonds

(B) 9 sigma bonds and 4 pi bonds

(C) 8 sigma bonds and 4 pi bonds

(D) 8 sigma bonds and 3 pi bonds

---

36. If $Z = \frac{2-i}{\alpha+i}$ and $4\,\mathbf{Re}(Z) = 3\,\mathbf{Im}(\overline{Z})$, find α.

(A) $\alpha = -2$

(B) $\alpha = 3$

(C) $\alpha = -3$

(D) $\alpha = 2$

---

37. Find the vertex of the parabola $4y = x^2 - 6x + 17$.

(A) $(3, 7)$

(B) $(1, 4)$

(C) $(3, 4)$

(D) $(1, 7)$

---

38. Solve the system of equations:

$$\begin{bmatrix} 4 & 9 \\ 12 & -3 \\ 8 & -2 \end{bmatrix} \begin{bmatrix} 7 \\ 9 \end{bmatrix} = \begin{bmatrix} \alpha \\ \beta \end{bmatrix}$$

(A) $\alpha = 166, \beta = 54$

(B) $\alpha = 153, \beta = 49$

(C) $\alpha = 155, \beta = 50$

(D) $\alpha = 160, \beta = 56$

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39. The cubic polynomial $2x^3 - 3x^2 - 36x + 28$ is increasing in the range of x. Find the interval where the function is increasing.

(A) $x > 2$

(B) $x < -2$

(C) $-2 < x < 2$

(D) $x < 0$

---

40. If $\cot^{-1}\left(\frac{\sqrt{1-x}}{\sqrt{1+x}}\right)$**, then find** $\sec^2\theta$**.**

(A) 1

(B) 2

(C) 3

(D) 4

---

41. What is the order of the SN2 reaction for the compounds:

2-methyl-2-bromo-butene,   2-bromo-butene,   1-bromo-butane

(A) 1, 2, 3

(B) 3, 2, 1

(C) 2, 1, 3

(D) 3, 1, 2

---

42. Which of the following bond enthalpies is the least:

$$C = C, C = O, C \equiv N, C = N$$

(A) $C = C$

(B) $C = O$

(C) $C \equiv N$

(D) $C = N$

---

43. The reaction shown is:

$$\text{Phenol} + \text{CHCl}_3 + \text{NaOH} \rightarrow \text{Salicylaldehyde}$$

What is the name of the above reaction?

(A) Aldol condensation

(B) Reimer-Tiemann reaction

(C) Friedel-Crafts reaction

(D) Kolbe-Schmidt reaction

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44. If the half-life of D is 1500 years and B is 2000 years, what is the mean lifetime?

(A) 1750 years

(B) 1800 years

(C) 1900 years

(D) 1850 years

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45. Common oxidation state of Cr?

(A) +3

(B) +2

(C) +6

(D) +1

---

46. What is the formula of lanthanoids with sulfur?

(A) La_2S_3

(B) LaS_2

(C) La_3S_4

(D) La_4S_3

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47. Among the following, which one is incorrect?

$BrF_5 \rightarrow$ Trigonal bipyramidal, $SF_4 \rightarrow$ See saw, $NH_3 \rightarrow$ Pyramidal, $XeF_4 \rightarrow$ Square planar

(A) BrF_5 Trigonal bipyramidal

(B) SF_4 See saw

(C) NH_3 Pyramidal

(D) XeF_4 Square planar

48. Which among the following has the highest molar elevation constant?

(A) $CHCl_3$

(B) CCl_4

(C) CH_3COOH

---

49. Find the rate constant at 310K if the initial concentration is 0.72 mol L^{-1} and the final concentration is 1.44 mol L^{-1} at 10 minutes.

(A) 0.05

(B) 0.0693

(C) 0.091

(D) 0.13

---

50. Arrange in the order of dipole moment:

$$NH_3, NF_3, H_2S, CHCl_2$$

(A) $NH_3 > NF_3 > H_2S > CHCl_2$

(B) $NF_3 > NH_3 > CHCl_2 > H_2S$

(C) $NH_3 > H_2S > CHCl_2 > NF_3$

(D) $CHCl_2 > H_2S > NF_3 > NH_3$

---

51. Arrange in the order of conductivity:

$$Na, Ag, Fe, Cu$$

(A) $Ag > Cu > Na > Fe$

(B) $Na > Cu > Fe > Ag$

(C) $Cu > Fe > Ag > Na$

(D) $Fe > Na > Cu > Ag$

---

52. Find the pH of the solution if $[H^+] = 2 \times 10^{-4}$ mol/L.

(A) 3.0

(B) 3.7

(C) 4.5

(D) 5.0

---

53. Which among the following acts as a Lewis acid?

$$A)AlCl_3, \quad B)NH_3, \quad C)OH^-, \quad D)H_2O$$
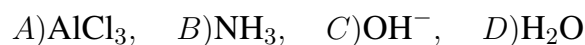
(A) $AlCl_3$

(B) NH_3

(C) OH^-

(D) H_2O

---

54. When toluene is treated with chromium oxide and acetic anhydride, followed by hydrolysis, what is the product formed?

(A) Toluene-2,4-diol

(B) Acetyl toluene

(C) Benzyl alcohol

(D) Benzoic acid

---

55. Layer's test is used for what purpose?

(A) To detect aldehydes

(B) To detect ketones

(C) To detect carboxylic acids

(D) To detect aromatic amines

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56. Which of the following has the highest K_b value?

(A) $CHCl_3$

(B) CCl_4

(C) CH_3COOH

(D) NH_3

---

57. What technique is used to separate chloroform from aniline?

(A) Fractional distillation

(B) Simple distillation

(C) Filtration

(D) Evaporation

---

58. What is the IUPAC name of phenyl isopentylether?

(A) 1-Phenylpentan-2-yl ether

(B) Phenylmethylether

(C) 2-Phenylethyl ether

(D) Phenyl isopropylether

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59. The disease is caused by a deficiency of riboflavin.

(A) Scurvy

(B) Pellagra

(C) Beriberi

(D) Rickets

---

60. In which of the following cases does manganese have a +7 oxidation state?

(A) $KMnO_4$

(B) MnO_2

(C) $MnCl_2$

(D) Mn_2O_3

---

61. A body of mass 0.8kg moves with velocity $v = 2x^2 + 2$ m/s. What is the work done during its motion from $x = 0$ to $x = 2$ m?

(A) 4.8 J

(B) 3.2 J

(C) 6.4 J

(D) 2.4 J

---

62. A body of mass 0.8kg moves with velocity $v = 2x^2 + 2$ m/s. What is the work done during its motion from $x = 0$ to $x = 2$ m?

(A) 4.8 J

(B) 3.2 J

(C) 6.4 J

(D) 2.4 J

---

63. A solid sphere, hollow sphere, and solid cylinder start sliding from an inclined plane without rolling. Then the ratio of time taken by them to reach the ground is?

(A) 1:2:3

(B) 1:1:1

(C) 1:3:2

(D) 3:2:1

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64. A liquid of density d is moving down in a vessel of height h with an acceleration $a < g$. Then the pressure at the bottom is?

(A) hdg

(B) $hd(g - a)$

(C) $hd(g + a)$

(D) $\frac{hdg}{a}$

---

65. De Broglie wavelength of a quantum photon having energy E?

(A) $\lambda = \frac{h}{E}$

(B) $\lambda = \frac{h}{\sqrt{E}}$

(C) $\lambda = \frac{E}{h}$

(D) $\lambda = \frac{h}{\sqrt{2E}}$

66. Work done on splitting a spherical drop into 8 droplets?

(A) $7 \times W$

(B) $8 \times W$

(C) $6 \times W$

(D) $4 \times W$

67. The fundamental frequency of a string of length l is n. The string is cut into 3 parts l_1, l_2, and l_3, each having fundamental frequency n_1, n_2, n_3. Then, what is the relationship between n_1, n_2, n_3?

(A) $n_1 = n_2 = n_3$

(B) $n_1 < n_2 < n_3$

(C) $n_1 > n_2 > n_3$

(D) $n_1 = 2n_2 = 3n_3$

68. Tension of a rope when a man of mass m climbs up or down with an acceleration $a < g$?

(A) $T = mg$

(B) $T = m(g - a)$

(C) $T = m(g + a)$

(D) $T = \frac{mg}{a}$

69. Wave nature of light can be used to explain which phenomenon?

(A) Reflection

(B) Refraction

(C) Diffraction

(D) Absorption

70. What is the maximum wavelength to excite a hydrogen atom?

(A) $\lambda = \frac{1}{13.6 \, \text{eV}}$

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(B) $\lambda = \frac{c}{R}$

(C) $\lambda = \frac{h}{E}$

(D) $\lambda = \frac{c}{E}$

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71. How can we decrease the effective capacitance of a parallel plate capacitor?

(A) Increase the distance between the plates

(B) Decrease the distance between the plates

(C) Increase the area of the plates

(D) Increase the dielectric constant

---

72. M^0LT^{-1} is the dimension of

?

(A) Power

(B) Work

(C) Energy

(D) Momentum

---

73. The inward electric flux through a closed surface is 6×10^{-5} and the outward flux is 3×10^{-5}. Then the total charge enclosed is?

(A) $9 \times 10^{-5}\,\text{C}$

(B) $3 \times 10^{-5}\,\text{C}$

(C) $6 \times 10^{-5}\,\text{C}$

(D) $0\,\text{C}$

---

74. Relation between the drift velocity and an electric field is —-?

(A) $v_d = \frac{E}{\mu}$

(B) $v_d = E \times \mu$

(C) $v_d = \frac{\mu}{E}$

(D) $v_d = \mu \times E^2$

---

75. Find the resistance required to be connected to a galvanometer of resistance $100\,\Omega$ **with a full scale deflection of 1mA into a voltmeter of range 1V.**

(A) $1000\,\Omega$

(B) $100\,\Omega$

(C) $900\,\Omega$

(D) $200\,\Omega$

---

76. Brewster's angle should lie between?

(A) $0°$ to $45°$

(B) $45°$ to $90°$

(C) $0°$ to $90°$

(D) $0°$ to $60°$

---

77. The ratio of the angular speed of the minute hand to the second hand of a watch is?

(A) $1 : 60$

(B) $1 : 3600$

(C) $1 : 360$

(D) $1 : 120$

---

78. Number of degrees of freedom for the monoatomic gas molecule is?

(A) 3

(B) 2

(C) 5

(D) 6

---

79. After a collision, two particles move together, then the collision is?

(A) Elastic

(B) Inelastic

(C) Perfectly elastic

(D) Super-elastic

80. Which of the following statement is true?

(A) Saturation current depends on intensity

(B) Saturation current does not depend on intensity

(C) K.E depends on intensity

(D) Photocurrent depends on frequency

81. In a Carnot engine, efficiency is dependent on

?

(A) Temperature of the hot reservoir

(B) Temperature of the cold reservoir

(C) Both hot and cold reservoir temperatures

(D) Heat input

82. The product of the first five terms of a GP is 32. What is the 3rd term?

(A) 4

(B) 2

(C) 8

(D) 16

83. What is the value of n when $t_n = \frac{n(n+6)}{n+4}$ and $t_n = 5$?

(A) 3

(B) 4

(C) 5

(D) 6

84. If $x + z = 2y$ and $y = \frac{\pi}{4}$, what is $\tan x \cdot \tan y \cdot \tan z$?

(A) 1

(B) 0

(C) $\sqrt{2}$

(D) 2

85. If $5\sin^{-1}\alpha + 3\cos^{-1}\alpha = \pi$**, then** $\alpha =$?

(A) $\frac{1}{2}$

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

(C) $\frac{1}{\sqrt{2}}$

(D) 1

---

86. If A **is a** 3×3 **matrix and** $|B| = 3|A|$ **and** $|A| = 5$**, then find** $\left|\frac{\mathbf{adj}B}{|A|}\right|$**.**

(A) 3

(B) 9

(C) 1

(D) 5

---

87. Find the value of Z^2 **if** $Z = \left(1 + \frac{1}{i}\right)$**.**

(A) 4

(B) 5

(C) 6

(D) 3

---

88. Find the standard deviation of the numbers: -3, 0, 3, 8.