NEW STANDARD ACADEMY

Exam | **JEE** | **Marks: 300**

Date :10-07-23 | **CLASS : 11TH** | **Time: 3 HRS**

Important Instructions:

1. Please read the instruction carefully. You are allotted five minutes specifically for this purpose.
2. The test is of 3 hours duration.
3. This test paper consists of 90 questions. Each subject (PCM) has 30 questions. The maximum marks are 300.
4. This question paper contains Three Parts. Section-A is Physics, Section-B is Chemistry and Section-C is Mathematics.
5. Each Section attempt only 25 questions out of 30 questions. Each question carries +4 marks for correct answer and –1 mark for wrong answer.

SECTION A
PHYSICS

1. The vernier scale of a travelling microscope has 50 divisions which coincide with 49 main scale divisions. If each main scale division is 0.5 mm, then the least count of the microscope is
(a) 0.01 cm (b) 0.5 mm (c) 0.01 mm (d)0.5 cm
2. The number of significant figures in the numbers 4.8000×10^4 and 48000.50 are respectively
(a) 5 and 6 (b) 5 and 7
(c) 2 and 7 (d) 2 and 6
3. A new system of units is proposed in which unit of mass is α kg, unit of length is β m and unit of time is γ s. What will be value of 5 J in this new system?
(a) $5\alpha\beta^2\gamma^{-2}$ (b) $5\alpha^{-1}\beta^{-2}\gamma^2$
(c) $5\alpha^{-2}\beta^{-1}\gamma^{-2}$ (d) $5\alpha^{-1}\beta^2\gamma^{-2}$
4. The sum of the numbers 436.32, 227.2 and 0.301 in appropriate significant figures is
(a) 663.821 (b) 664 (c) 663.8 (d) 663.82
5. A body travels uniformly a distance of (13.8 ± 0.2) m in a time (4.0 ± 0.3) s. Its velocity with error limits is
(a) (3.5 ± 0.6) m s^{-1} (b) (3.5 ± 0.3) m s^{-1}
(c) (6.1 ± 0.6) m s^{-1} (d) (6.1 ± 0.3) m s^{-1}
6. The equation $\left(P + \frac{a}{V^2}\right)(V - b) =$ constant. The units of a is
(a) $Dyne \times cm^5$ (b) $Dyne \times cm^4$
(c) $Dyne / cm^3$ (d) $Dyne / cm^2$
7. If $x = at + bt^2$, where x is the distance travelled by the body in kilometre while t the time in seconds, then the units of b are
(a) km/s (b) km-s (c) km/s^2 (d) km-s^2
8. In C.G.S. system the magnitude of the force is 100 dynes. In another system where the fundamental physical quantities are kilogram, metre and minute, the magnitude of the force is
(a) 0.036 (b) 0.36 (c) 3.6 (d) 36
9. A physical quantity P is given by P= $\frac{A^3 B^{\frac{1}{2}}}{C^{-4} D^{\frac{3}{2}}}$. The quantity which brings in the maximum percentage error in P is
(a) A (b) B (c) C (d) D
10. A vernier calipers has 1 mm marks on the main scale. It has 20 equal division on the Vernier scale which match with 16 main scale divisions. For this Vernier calipers, the least count is :
(a) 0.02 mm (b) 0.05 mm
(c) 0.1 mm (d) 0.2 mm
11. In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows :
$$P = \frac{a^3 b^2}{cd}$$
Maximum % error in P is :
(a) 10% (b) 7%
(c) 4% (d) 14%
12. The least count of the main scale of a screw gauge is 1 mm. The minimum number of divisions on its circular scale required to measure 5 μm diameter of a wire is:
(a) 200 (b) 50
(c) 500 (d) 100
13. In CGS system of units, the density of a material is 4 g cm^{-3}. What will be the

value of the density of the material in a system of units in which unit of length is 10 cm and unit of mass is 100 g?

(a) 0.04 (b) 0.4
(c)40 (d)400

14. The dimensions of $\frac{a}{b}$, in the equation $P=\frac{a-t^2}{bx}$, where P is pressure, x is distance and tistime, are

(a) $[M^2LT^{-3}]$ (b) $[MT^{-2}]$
(c) $[ML^3T^{-1}]$ (d) $[LT^{-3}]$

15. In a system of units, if force (F), acceleration (A) and time (T) are taken as fundamental units, then the dimensional formula of energy is

(a) $[FA^2T]$ (b) $[FAT^2]$
(c) $[F^2AT]$ (d) $[FAT]$

16. If a vector $2\hat{i}+3\hat{j}+8\hat{k}$ is perpendicular to the vector $4\hat{j}-4\hat{i}+\alpha\hat{k}$ then the value of α is

(a) 1/2 (b) – 1/2 (c) 1 (d) – 1

17. $y = \ell nx + e^x$, then $\frac{d^2y}{dx^2}$ is equal to

(a) $\frac{1}{x^2}-e^x$ (b) $\frac{1}{x^2}+e^x$
(c) $\frac{1}{x}+e^x$ (d) $-\frac{1}{x^2}+e^x$

18. Given $s = t^2 + 5t + 3$, find $\frac{ds}{dt}$, at t = 1

(a) 7 (b) 9
(c) 12 (d) 15

19. $\int(x^2-2x+1)dx$

(a) $\frac{x^3}{3}+x^2-x-c$
(b) $\frac{x^3}{3}+x+x+c$
(c) $\frac{x}{3}+x^2+x-c$
(d) $\frac{x^3}{3}-x^2+x+c$

20. $\int\left(\frac{\sqrt{x}}{2}+\frac{2}{\sqrt{x}}\right)dx$

(a) $\frac{x^{3/2}}{3}+4x^{1/2}+C$ (b) $\frac{x^{3/2}}{3}+x^{1/2}+C$
(c) $\frac{x^{3/2}}{3}+4x^{2/5}+C$ (d) $\frac{x^{3/2}}{3}+4x^2+C$

21. The vector joining the points A (1, 1, –1) and B (2, –3, 4) and pointing from A to B is -

(a) $-\hat{i}+4\hat{j}-5\hat{k}$ (b) $\hat{i}+4\hat{j}+5\hat{k}$
(c) $\hat{i}-4\hat{j}+5\hat{k}$ (d) $-\hat{i}-4\hat{j}-5\hat{k}$

22. The vector sum of the forces of 10 N and 6 N can be

(a) 2 N (b) 8 N
(c) 18 N (d) 20 N.

23. The vector sum of two force P and Q is minimum when the angle θ between their positive directions, is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$
(c) $\frac{\pi}{2}$ (d) π.

24. The angle θ between directions of forces $\vec{A}$ and $\vec{B}$ is 90º where A = 8 dyne and B = 6 dyne. If the resultant $\vec{R}$ makes an angle α with $\vec{A}$ then find the value of 'α'?

(a) 47º (b) 37º
(c) 75º (d) 120º

25. If $\vec{A}=3\hat{i}+4\hat{j}$ and $\vec{B}=\hat{i}+\hat{j}+2\hat{k}$ then find out unit vector along $\vec{A}+\vec{B}$

(a) $\frac{4\hat{i}+5\hat{j}-2\hat{k}}{\sqrt{45}}$ (b) $\frac{2\hat{i}-5\hat{j}-2\hat{k}}{\sqrt{45}}$
(c) $\frac{4\hat{i}-2\hat{j}+2\hat{k}}{\sqrt{45}}$ (d) $\frac{4\hat{i}+5\hat{j}+2\hat{k}}{\sqrt{45}}$

26. The projection of a vector $3\hat{i}+4\hat{k}$ on y-axis is :

(a) 5 (b) 4
(c) 3 (d) 0

27. If $\vec{A}=4\hat{i}+n\hat{J}-2\hat{k}$ and $\vec{B}=2\hat{i}+3\hat{J}+\hat{k}$, then find the value of n so that $\vec{A}\perp\vec{B}$.

(a) n = 2 (b) n = – 1
(c) n + 1 (d) n = – 2

28. If $\vec{F}=(4\hat{i}-10\hat{j})$ and $\vec{r}=(5\hat{i}-3\hat{j})$, then calculate torque $(\vec{\tau}=\vec{r}\times\vec{F})$

(a) $-38\hat{k}$ (b) $-35\hat{k}$
(c) $-55\hat{k}$ (d) $-28\hat{k}$

29. Area of a parallogram, whose diagonals are $3i+\hat{j}-2\hat{k}$ and $i-3\hat{j}+4\hat{k}$ will be

(a) 14 unit (b) $5\sqrt{3}$
(c) $10\sqrt{3}$ (d) $20\sqrt{3}$

30. Vectors $\vec{A}=\hat{i}+\hat{j}-2\hat{k}$ and $\vec{B}=3\hat{i}+3\hat{j}-6\hat{k}$ are:

(a) Parallel
(b) Antiparallel
(c) Perpendicular
(d) at acute angle with each other

SECTION B
CHEMISTRY

31. When 100 *ml* of 1 M $NaOH$ solution and 10 ml of 10 N H_2SO_4 solution are mixed together, the resulting solution will be
(a)Alkaline (b) Acidic
(c)Strongly acidic (d)Neutral

32. 1 mol of CH_4 contains
(a) 6.02×10^{23} atoms of H
(b) 4 *g* atom of Hydrogen
(c) 1.81×10^{23} molecules of CH_4
(d) 3.0 *g* of carbon

33. What should be the equivalent weight of phosphorous acid, if *P*=31; *O*=16; *H*=1
(a) 82 (b) 41
(c) 20.5 (d) None of these

34. The weight of a molecule of the compound $C_{60}H_{122}$ is
(a) 1.4×10^{-21} g (b) 1.09×10^{-21} g
(c) 5.025×10^{23} g (d) 16.023×10^{23} g

35. The equivalent weight of $MnSO_4$ is half its molecular weight when it is converted to
(a) Mn_2O_3 (b) MnO_2
(c) MnO_4 (d) MnO_4^{2-}

36. On reduction with hydrogen, 3.6 g of an oxide of metal left 3.2 g of metal. If the vapour density of metal is 32, the simplest formula of the oxide would be
(a) MO (b) M_2O_3
(c) M_2O (d) M_2O_5

37. The number of water molecules present in a drop of water (volume 0.0018 *ml*) at room temperature is
(a) 6.023×10^{19} (b) 1.084×10^{18}
(c) 4.84×10^{17} (d) 6.023×10^{23}

38. The total number of protons in 10 *g* of calcium carbonate is ($N_0 = 6.023 \times 10^{23}$)
(a) 1.5057×10^{24} (b) 2.0478×10^{24}
(c) 3.0115×10^{24} (d) 4.0956×10^{24}

39. The number of molecules in 16 *g* of methane is
(a) 3.0×10^{23} (b) 6.02×10^{23}
(c) $\frac{16}{6.02} \times 10^{23}$ (d) $\frac{16}{3.0} \times 10^{23}$

40. Cathode rays are
(a) Protons (b) Electrons
(c) Neutrons (d) α -particles

41. An elementary particle is
(a) An element present in a compound
(b) An atom present in an element
(c) A sub-atomic particle
(d) A fragment of an atom

42. The nucleus of helium contains
(a) Four protons
(b) Four neutrons
(c) Two neutrons and two protons
(d) Four protons and two electrons

43. The charge on the atom containing 17 protons, 18 neutrons and 18 electrons is
(a) $+1$ (b) -2
(c) -1 (d) Zero

44. Nuclei tend to have more neutrons than protons at high mass numbers because
(a) Neutrons are neutral particles
(b) Neutrons have more mass than protons
(c) More neutrons minimize the coulomb repulsion
(d) Neutrons decrease the binding energy

45. Which one of the following is not isoelectronic with O^{2-}
(a) N^{3-} (b) F^-
(c) Tl^+ (d) Na^+

46. The number of electrons and neutrons of an element is 18 and 20 respectively. Its mass number is
(a) 17 (b) 37
(c) 2 (d) 38

47. An isostere is
(a) NO_2^- and O_3 (b) NO_2^- and PO_4^{3-}
(c) CO_2, N_2O, NO_3^- (d) ClO_4^- and OCN^-

48. The number of electrons in Cl^- ion is
(a) 19 (b) 20
(c) 18 (d) 35

49. The nucleus of an element contain 9 protons. Its valency would be
(a) 1 (b) 3
(c) 2 (d) 5

50. The compound in which cation is isoelectronic with anion is
(a) $NaCl$ (b) CsF
(c) NaI (d) K_2S

51. Which among the following species have the same number of electrons in its outermost as well as penultimate shell
(a) Mg^{2+} (b) O^{2-}

(c) F^- (d) Ca^{2+}

52. Number of neutrons in heavy hydrogen atom is
(a) 0 (b) 1
(c) 2 (d) 3

53. When atoms are bombarded with alpha particles, only a few in million suffer deflection, others pass out undeflected. This is because
(a) The force of repulsion on the moving alpha particle is small
(b) The force of attraction on the alpha particle to the oppositely charged electrons is very small
(c) There is only one nucleus and large number of electrons
(d) The nucleus occupies much smaller volume compared to the volume of the atom

54. Existence of positively charged nucleus was established by
(a) Positive ray analysis
(b) α -ray scattering experiments
(c) X-ray analysis
(d) Discharge tube experiments

55. When an electron drops from a higher energy level to a low energy level, then
(a) Energy is emitted
(b) Energy is absorbed
(c) Atomic number increases
(d) Atomic number decreases

56. The energy of second Bohr orbit of the hydrogen atom is –328 $kJ\ mol^{-1}$, hence the energy of fourth Bohr orbit would be
(a) – 41 $kJ\ mol^{-1}$ (b) –1312 $kJ\ mol^{-1}$
(c) –164 $kJ\ mol^{-1}$ (d) – 82 $kJ\ mol^{-1}$

57. When an electron revolves in a stationary orbit then
(a) It absorbs energy
(b) It gains kinetic energy
(c) It emits radiation
(d) Its energy remains constant

58. A moving particle may have wave motion, if
(a) Its mass is very high
(b) Its velocity is negligible
(c) Its mass is negligible
(d) Its mass is very high and velocity is negligible

59. The postulate of Bohr theory that electrons jump from one orbit to the other, rather than flow is according to
(a) The quantisation concept
(b) The wave nature of electron
(c) The probability expression for electron
(d) Heisenberg uncertainty principl

60. The expression for Bohr's radius of an atom is
(a) $r = \frac{n^2h^2}{4\pi^2 me^4 z^2}$ (b) $r = \frac{n^2h^2}{4\pi^2 me^2 z}$
(c) $r = \frac{n^2h^2}{4\pi^2 me^2 z^2}$ (d) $r = \frac{n^2h^2}{4\pi^2 m^2 e^2 z^2}$

SECTION B
MATHS

61. Let $X = \{n \in N : 1 \le n \le 50\}$. If $A = \{x \in X : n$ is a multiple of $2\}$; $B = \{n \in X : n$ is a multiple of $7\}$, then the number of elements in the smallest subset X containing both A and B is ....

62. Set A has m elements and Set B has n elements. If the total number of subsets of A is 112 more than the total number of subsets of B, then the value of $m \cdot n$ is ...

63. If x = $\prod_{n=1}^{2000} n$, then the value of the expression, $\dfrac{1}{\frac{1}{\log_2 x} + \frac{1}{\log_3 x} + ... + \frac{1}{\log_{2000} x}}$ is ....

64. The number N = $\frac{\log_5 250}{\log_{50} 5} - \frac{\log_5 10}{\log_{1250} 5}$ when simplified reduces to a natural number N. find N

65. The number N = $6\log_{10}2 + \log_{10}31$ lies between two successive integers whose sum equals ——

66. If $\log\left(\frac{x^2}{y^3}\right) = 1$ & $\log(x^2y^3) = 7$ then log |xy| is equal to……..

67. If both roots of equation $4x^2 - 20px + 25p^2 + 15p - 66 = 0$ are greater than 2, then sum of all possible integral values of p is ——

68. Let a is real number then minimum number of real roots of equation $(x^2 + ax + 1)(3x^2 + ax - 3) = 0$ can be ——

69. The value of ‘a’ for which $x^3 + ax - 1 = 0$ & $x^4 + ax^2 + 1 = 0$ have a common root is – k then k equals

70. The value of ‘‘a’’ for which all roots of quadratic equation, $f(x) = (a-2)x^2 + 2ax + a + 3 = 0$ lies in (– 2, 1) belongs to $\left(-\infty, -\frac{1}{4}\right) \cup (m, n]$ then value of n – m is

71. If $f(x) = x^2 - 4ax + 5a^2 - 6a$ then largest distance between the zeroes of f(x).
a. 9 b. 11 c. 13 d. 15

72. If $A = \{a,b\}, B = \{c,d\}, C = \{d,e\}$, then $\{(a,c),(a,d),(a,e),(b,c),(b,d),(b,e)\}$ is equal to

(a) $A \cap (B \cup C)$ (b) $A \cup (B \cap C)$
(c) $A \times (B \cup C)$ (d) $A \times (B \cap C)$

73. Given two finite sets A and B such that n(a) = 2, n(b) = 3. Then total number of relations from A to B is
(a) 4 (b) 8 (c) 64 (d)None of these

74. Two finite sets have *m* and *n* elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of *m* and *n* are
(a) 7, 6 (b) 6, 3 (c) 5, 1 (d) 8, 7

75. If the roots of the equation $ax^2 + bx + c = 0$ are in the ratio m : n, then
(a) $mn\, b^2 = ac\,(m + n)^2$ (b) $b^2\,(m + n) = mn$
(c) $m + n = b^2mn$ (d) $mnc^2 = ab\,(m + n)^2$

76. If both roots of equation $x^2 - ax - 8 = 0$ lie in interval $(-2, 2)$ then set of all values of a is
(a) (0, 5) (b) $(-\infty, 2)$
(c) $(-\infty, -2)$ (d) ϕ

77. Number of integral solutions of $\frac{x+2}{x^2+1} > \frac{1}{2}$ is –
(a) 0 (b) 1 (c) 2 (d) 3

78. If a, b, c be the sides of ΔABC and equations $ax^2 + bx + c = 0$ and $5x^2 + 12x + 13 = 0$ have a common root, then $\angle C$ is-
(a) 60^0 (b) 90^0 (c) 120^0 (d) 45^0

79. The number of real roots of quadratic equation
$\sum_{k=1}^{n}(x-k)^2 = 0$ (n> 1), is-
(a) 1 (b) 2 (c) n (d) 0

80. If $p, q \in \{1, 2, 3, 4\}$, the number of equations of the form $px^2 + qx + 1 = 0$ having real roots is–
(a) 15 (b) 9 (c) 7 (d) 8

81. If the sum of squares of roots of equation
$x^2 - (\sin\alpha - 2)\,x - (1 + \sin\alpha) = 0$ is the least, then α is equal
to -
(a) $\pi/4$ (b) $\pi/3$ (c) $\pi/2$ (d) $\pi/6$

82. If a > 1 then the roots of the equation $(1 - a)x^2 + 3ax - 1 = 0$ are -
(a) One positive and one negative
(b) Both negative
(c) Both positive (d) Both non real complex

83. The number of real solutions of the equation
$x^2 - |4x + 12| + 16 = 0$ is-
(a) 1 (b) 2 (c) 3 (d) 4

84. The set of possible values of λ for which
$x^2 - (\lambda^2 - 5\lambda + 5)\,x + (2\lambda^2 - 3\lambda - 4) = 0$ has roots, whose sum and product are both less than 1, is -
(a) $\left(-1, \frac{5}{2}\right)$ (b) (1, 4) (c) $\left[1, \frac{5}{2}\right]$ (d) $\left(1, \frac{5}{2}\right)$

85. If the quadratic equations, $3x^2 + ax + 1 = 0$ and $2x^2 + bx + 1 = 0$ have a common root, then the value of the
expression $5ab - 2a^2 - 3b^2$ is:
(a) 0 (b) 1 (c) –1 (d) None of these

86. $|2x - 3| < |x + 5|$, then x belongs to
(a) $(-3, 5)$ (b) (5, 9)
(c) $\left(-\frac{2}{3}, 8\right)$ (d) $\left(-8, \frac{2}{3}\right)$

87. The equation $3^{x-1} + 5^{x-1} = 34$ has
(a) No solution (b) One solution
(c) Two solutions (d)Morethan two solutions

88. If α, β are the roots of $ax^2 - 2bx + c = 0$, then $\alpha^3\beta^3 + \alpha^2\beta^3 + \alpha^3\beta^2$ is -
(a) $\frac{c^2(c+2b)}{a^3}$ (b) $\frac{bc^3}{a^3}$ (c) $\frac{c^2}{a^3}$ (d) None

89. The quadratic equation $8\sec^2\theta - 6\sec\theta + 1 = 0$ has -
(a) Exactly two roots (b) Exactly four roots
(c) Infinitely many roots(d) No roots

90. α, β are roots of the equation $\lambda(x^2 - x) + x + 5 = 0$. If λ_1 and λ_2 are the two values of λ for which the roots α, β are connected by the relation $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = 4$, then the value of $\frac{\lambda_1}{\lambda_2} + \frac{\lambda_2}{\lambda_1}$ is -
(a) 150 (b) 254 (c) 180 (d) 1022