Sample Paper

XII Studying(JEE)
Time: 2 Hours | Max. Marks: 240

PHYSICS, CHEMISTRY & MATHEMATICS

Do not open this Test Booklet until you are asked to do so.

Important Instructions:

1. Immediately fill in the particulars on this page of the Test Booklet with Blue/ Black Ball Point Pen. Use of pencil is strictly prohibited.

2. The Answer Sheet is kept inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully.

3. The test is of **2 hours** duration.

4. The Test Booklet consists of **75** questions. The maximum marks are **240**.

5. There are **three** parts in the question paper A, B, C consisting of **Physics, Chemistry and Mathematics** having 20 questions in each part.

6. Each subject will have two sections. Section A will be of Multiple - Choice Question (MCQs) in which only one option is correct and Section B will contains questions whose answers are to be filled in as a numerical value. In Section B, candidates have to attempt any 5 questions out of 10.

7. Candidates will be awarded four marks for every correct response. ¼ (one fourth) marks will be deducted for indicating incorrect response for section A whereas there is no negative marking for section B. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

8. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 7 above.

9. Use **Blue/ Black Ball Point Pen only** for writing particulars/ marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**

10. No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. except the Admit Card inside the examination room/hall.

11. Rough work is to be done in the space provided for this purpose in the Test Booklet only. This space is given at the bottom of each page and two pages at the end of the booklet.

12. On completion of the test, the candidates must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. **However, the candidates are allowed to take away this Test Booklet with them.**

13. **Do not fold or make any stray mark on the Answer Sheet.**

SECTION: A
(ONLY ONE OPTION CORRECT TYPE)
PART A: PHYSICS

01. Light of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively illuminate a metallic surface whose work function is 0.5 eV successively. Ratio of maximum speeds of emitted electrons will be
    (1) 1 : 4
    (2) 1 : 2
    (3) 1 : 1
    (4) 1 : 5

02. A physical quantity of the dimension of length that can be formed out of c, G and $\dfrac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge]

    (1) $c^2\left[G\,\dfrac{e^2}{4\pi\varepsilon_0}\right]^{\frac{1}{2}}$

    (2) $\dfrac{1}{c^2}\left[\dfrac{e^2}{G4\pi\varepsilon_0}\right]^{\frac{1}{2}}$

    (3) $\dfrac{1}{c^2}\,G\,\dfrac{e^2}{4\pi\varepsilon_0}$

    (4) $\dfrac{1}{c^2}\left|G\,\dfrac{e^2}{4\pi\varepsilon_0}\right|^{\frac{1}{2}}$

03. Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d (d << l) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as:

    (1) $v \propto \dfrac{1}{x^2}$

    (2) $v \propto x$

    (3) $v \propto x^{-\frac{1}{2}}$

    (4) $v \propto x^{-1}$

04. A rectangular, a square, a circular and an elliptical loop, all in the (x – y) plane, are moving out of a uniform magnetic field with a constant velocity, $\vec{V} = v\hat{i}$. The magnetic field is directed along the negative z axis direction. The induced emf, during the passage of these loops, out of the field region, will not remain constant for
   (1) the circular and the elliptical loops
    (2) only the elliptical loop
    (3) any of the four loops
    (4) the rectangular, circular and elliptical loops

05. The electric field in a certain region is acting radially outward and is given by E = Aa. A charge contained in a sphere of radius 'a' centred at the origin of the field, will be given by
    (1) $A\,\varepsilon_0\,a^2$
    (2) $4\,\pi\varepsilon_0\,As^3$
    (3) $\varepsilon_0\,Aa$
    (4) $4\,\pi\varepsilon_0\,Aa^2$

06. The stable nucleus that has a radius half that of Fe^{56} is
    (1) Li^7
    (2) Na^2
    (3) S^{16}
    (4) Ca^{40}

07. The coefficient of static friction, μ_s between block A of mass 2 kg and the table as shown in the figure is 0.2. What would be the maximum mass value of block B so that the two blocks do not move? The string and the pulley are assumed to be smooth and massless. $(g = 10\ m/s^2)$
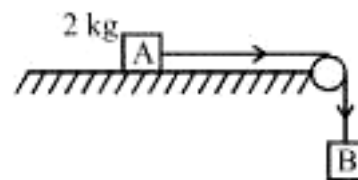

    (1) 0.4 kg
    (2) 2.0 kg
    (3) 4.0 kg
    (4) 0.2 kg

08. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless raod. If the banking angle is 45°, the speed of the car is:
    (1) $20\ ms^{-1}$
    (2) $30\ ms^{-1}$
    (3) $5\ ms^{-1}$
    (4) $10\ ms^{-1}$

Space for rough work

09. An inductance L having a resistance R is connected to an alternating source of angular frequency ω. The quality factor Q of the inductance is

(1) $\dfrac{R}{\omega L}$

(2) $\left(\dfrac{\omega L}{R}\right)^2$

(3) $\left(\dfrac{R}{\omega L}\right)^{\frac{1}{2}}$

(4) $\dfrac{\omega L}{R}$

10. If in nuclear fusion process the masses of the fusing nuclei be m_1 and m_2 and the mass of the resultant nucleus be m_3, then

(1) $m_3 > (m_1 + m_2)$

(2) $m_3 = m_1 + m_2$

(3) $m_3 = |m_1 - m_2|$

(4) $m_3 < (m_1 + m_2)$

11. The electric and magnetic field of an electromagnetic wave are

(1) in opposite phase and perpendicular to each other

(2) in opposite phase and parallel to each other

(3) in phase and perpendicular to each other

(4) in phase and parallel to each other.

12. What is the respective number of α and β -particles emitted in the following radioactive decay $^{200}X_{90} \rightarrow {}^{168}Y_{80}$?

(1) 6 and 8

(2) 6 and 6

(3) 8 and 8

(4) 8 and 6

13. A lens having focal length f and aperture of diameter form an image of intensity I. Aperture of diameter $\dfrac{d}{2}$ in central region of lens is covered by a black paper. Focal length of lens and intensity of image now will be respectively

(1) f and $\dfrac{I}{4}$ (2) $\dfrac{3f}{4}$ and $\dfrac{I}{2}$

(3) f and $\dfrac{3I}{4}$ (4) $\dfrac{f}{2}$ and $\dfrac{I}{2}$

14. In a junction diode, the holes are due to

(1) protons

(2) extra electrons

(3) neutrons

(4) missing electrons

15. In the circuit shown, if a conducting wire is connected between points A and B, the current in this wire will
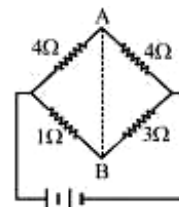
(1) flow in the direction which will be decided by the value of V

(2) be zero

(3) flow from B to A

(4) flow from A to B

PART B: CHEMISTRY

16. Calculate the degree of ionisation of 0.04 M HOCl solution having ionisation constant 1.25×10^{-4}?

(1) 0.025

(2) 0.5

(3) 0.25

(4) 0.055

Space for rough work

17. In a crystalline solid, X atoms occupy hcp and $\frac{1}{4}$ th of tetrahedral voids are occupied by Y atoms. Then empirical formula of crystalline solid is
    (1) X_2Y (2) XY_2
    (3) X_4Y (4) XY

18. Bohr's model is able to explain
    (1) Zeeman effect
    (2) Stark effect
    (3) Bond formation of H_2
    (4) Hydrogens spectrum

19. On increasing temperature from 200 K to 220 K rate of reaction A increase by 3 times and rate of reaction B increases by 9 times then correct relationship between activation energy of A and B is
    (1) $E_A = 3\,E_B$ (2) $3\,E_A = E_B$
    (3) $E_B = 2E_A$ (4) $E_A = 2E_B$

20. Calculate work done during isothermal reversible process when 5 mol ideal gas is expanded so that its volume is doubled at 400 K.
    (1) –11.5 kJ
    (2) –344 kJ
    (3) 0
    (4) –2.8 kJ

21. The K_{sp} of AgCl at 25°C is 2.56×10^{-10}. Then how much volume of H_2O is required to dissolve 0.01 mole of salt?
    (1) 800 L (2) 400 L
    (3) 625 L (4) 50 L

22. If radius of octahedral void is r and radius of atoms which shows close packing is R, then what will be radius of void in terms of radius of atoms?
    (1) $\left(\sqrt{2}-1\right)R$ (2) $\sqrt{2}R$
    (3) $\dfrac{R}{\sqrt{2}}$ (4) $\dfrac{R}{2\sqrt{2}}$

23. For a first order reaction, rate constant is given as $\log k = 14 - \dfrac{1.2 \times 10^4}{T}$, then what will be value of temperature if its half life period is 6.93×10^{-3} min?
    (1) 100 K
    (2) 1000 K
    (3) 720 K
    (4) 327 K

24. The molecular shape of SF_4, CF_4, and XeF_4 are:
    (1) The same, with 2, 0, and 1 lone pair of electrons, respectively
    (2) The same, with 0, 2, and 1 lone pair of electrons, respectively
    (3) Different, with 0, 1, and 2 lone pair of electrons, respectively
    (4) Different, with 1, 0, and 2 lone pair of electrons, respectively

25. The ionic radii (in Å) of N^{3-}, O^{2-} and F^- are respectively:
    (1) 1.36, 1.40 and 1.71
    (2) 1.36, 1.71 and 1.40
    (3) 1.71, 1.40 and 1.36
    (4) 1.71, 1.36 and 1.40

26. The crystal field splitting energy for octahedral (Δ_o) and tetrahedral (Δ_t) complexes is related as:
    (1) $\Delta_t = \dfrac{4}{9}\Delta_o$ (2) $\Delta_t = \dfrac{1}{2}\Delta_o$
    (3) $\Delta_o = -2\Delta_t$ (4) $\Delta_o = -\dfrac{4}{9}\Delta_t$

27. Good reducing nature of H_3PO_2 is attributed to the presence of:
    (1) Two P–H bonds (2) One P–OH bond
    (3) One P–H bond (4) Two P–OH bonds
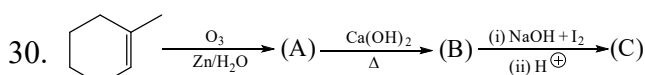
Space for rough work

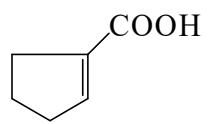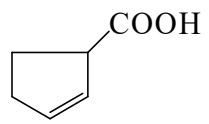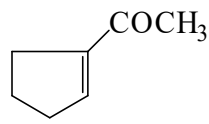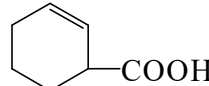28. The product P obtained through the following sequence of reaction is
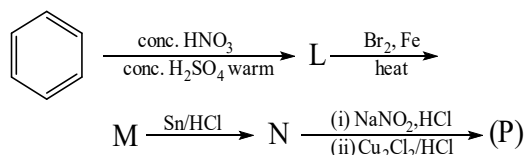
(1) 3–Chloroaniline

(2) 3–Bromochlorobenzene

(3) 1–Bromo–3–chlorobenzene

(4) 3–Bromoaniline

29. IUPAC name of this compound is
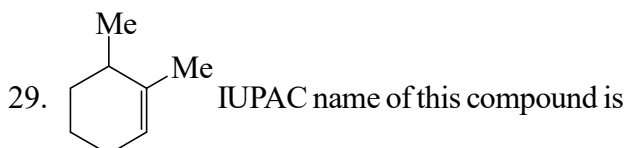
(1) 1, 2–Dimethyl cyclohex–2–ene

(2) 1, 2–Dimethyl cyclohex–1–ene

(3) 2, 3–Dimethyl cyclohex–1–ene

(4) 1, 6–Dimethyl cyclohex–1–ene

30.

Identify product (C)

(1)

(2)

(3)

(4)

31. Point 'A' lies on the curve $y = e^{-x^2}$ and has the coordinate (x, e^{-x^2}) where $x > 0$. Point B has the coordinates $(x, 0)$. If 'O' is the origin then the maximum area of the triangle AOB is

(1) $\dfrac{1}{\sqrt{2e}}$ (2) $\dfrac{1}{\sqrt{4e}}$

(3) $\dfrac{1}{\sqrt{e}}$ (4) $\dfrac{1}{\sqrt{8e}}$

32. If $a < b < c < d$ & $x \in R$ then the least value of the function,
$f(x) = |x - a| + |x - b| + |x - c| + |x - d|$ is
(1) $c - d + b - a$
(2) $c + d - b - a$
(3) $c + d - b + a$
(4) $c - d + b + a$

33. The area bounded in the first quadrant by the normal at $(1, 2)$ on the curve $y^2 = 4x$, x-axis & the curve is given by:

(1) $\dfrac{10}{3}$ (2) $\dfrac{7}{3}$

(3) $\dfrac{4}{3}$ (4) $\dfrac{9}{2}$

34. The area of the region(s) enclosed by the curves $y = x^2$ and $y = \sqrt{|x|}$ is

(1) 1/3 (2) 2/3
(3) 1/6 (4) 1

35. If $S = 1^2 + 3^2 + 5^2 + ... + (99)^2$ then the value of the sum $2^2 + 4^2 + 6^2 + ... + (100)^2$ is
(1) $S + 2550$
(2) $2S$
(3) $4S$
(4) $S + 5050$

Space for rough work

36. In $\triangle ABC$ if $a = 8$, $b = 9$, $c = 10$, then the value of $\dfrac{\tan C}{\sin B}$ is

(1) $\dfrac{32}{9}$

(2) $\dfrac{24}{7}$

(3) $\dfrac{21}{4}$

(4) $\dfrac{18}{5}$

37. If $\dfrac{\cos 3x}{\cos x} = \dfrac{1}{3}$ for some angle x, $0 \le x \le \dfrac{\pi}{2}$, then the value of $\dfrac{\sin 3x}{\sin x}$ for some x, is

(1) $\dfrac{7}{3}$

(2) $\dfrac{5}{3}$

(3) 1

(4) $\dfrac{2}{3}$

38. Let a_n, $n \in N$ is an A.P. with common difference 'd' and all whose terms are non-zero. If n approaches infinity, then the

sum $\dfrac{1}{a_1 a_2} + \dfrac{1}{a_2 a_3} + \dots\dots + \dfrac{1}{a_n a_{n+1}}$ will approach

(1) $\dfrac{1}{a_1 d}$

(2) $\dfrac{2}{a_1 d}$

(3) $\dfrac{1}{2a_1 d}$

(4) $a_1 d$

39. The value of $\operatorname{cosec} \dfrac{\pi}{18} - \sqrt{3} \sec \dfrac{\pi}{18}$ is a

(1) surd

(2) rational which is not integral

(3) negative natural number

(4) natural number

40. A is an involutary matrix given by

$A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$ then the inverse of $\dfrac{A}{2}$ will be

(1) 2A

(2) $\dfrac{A^{-1}}{2}$

(3) $\dfrac{A}{2}$

(4) A^2

41. The value of the determinant

$\begin{vmatrix} a^2 & a & 1 \\ \cos(nx) & \cos(n+1)x & \cos(n+2)x \\ \sin(nx) & \sin(n+1)x & \sin(n+2)x \end{vmatrix}$

is independent of:

(1) n

(2) a

(3) x

(4) a , n and x

42. The area bounded by the curve $y = f(x)$, the x-axis & the ordinates $x = 1$ & $x = b$ is $(b-1)\sin(3b+4)$. Then $f(x)$ is :

(1) $(x-1)\cos(3x+4)$

(2) $\sin(3x+4)$

(3) $\sin(3x+4) + 3(x-1)\cdot\cos(3x+4)$

(4) none

43. Let p denotes the probability that in a group of 4 persons all are born on different days of the week, then p must lie in the interval :

(1) $\dfrac{1}{3} < p < \dfrac{1}{2}$

(2) $\dfrac{1}{4} < p < \dfrac{1}{3}$

(3) $\dfrac{1}{6} < p < \dfrac{1}{3}$

(4) none

Space for rough work

44. If $A = \begin{bmatrix} \cos^2 \alpha & \sin \alpha \cos \alpha \\ \sin \alpha \cos \alpha & \sin^2 \alpha \end{bmatrix}$;

$B = \begin{bmatrix} \cos^2 \beta & \sin \beta \cos \beta \\ \sin \beta \cos \beta & \sin^2 \beta \end{bmatrix}$

are such that, AB is a null matrix, then which of the following should necessarily be an odd integral multiple of $\frac{\pi}{2}$.

(1) α (2) β

(3) $\alpha - \beta$ (4) $\alpha + \beta$

45. Let R be the region in the first quadrant bounded by the x and y axis and the graphs of $f(x) = \frac{9}{25}x + b$ and $y = f^{-1}(x)$. If the area of R is 49, then the value of b, is

(1) $\frac{18}{5}$ (2) $\frac{22}{5}$

(3) $\frac{28}{5}$ (4) none

SECTION - B
(INTEGER TYPE)
PART A: PHYSICS

46. The half life of a radioactive nucleus is 50 days. The time interval $(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of it has decayed and the time t_1 when $\frac{1}{3}$ of it had decayed is: (in days)

47. An ideal gas follows a polytrophic process $V = K\, T^{2/3}$ [K is a constant]. If Temp of gas is raised by 90°C, work done by gas is xR. Find x?

48. A wire of resistance 12 ohms per meter is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B as shown in the figure, is (in Ω)
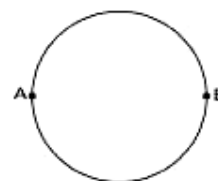

49. The motion of a particle along a straight line is described by equation:

$$x = 8 + 12t - t^3$$

where x is in metre and t in second. The retardation of the particle when its velocity becomes zero, is: (in ms^{-2})

50. A ball is dropped from a high rise platform at t = 0 starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at t = 18s. What is the value of v? (take g = 10 m/s²) (in ms^{-1})

51. If two mirrors are kept inclined at 60° to each other and a body is placed at the middle, then total number of images formed is

52. A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is (in ms^{-2})

53. A zener diode, having breakdown voltage equal to 15V, is used in a voltage regulator circuit shown in figure. The current through the diode is (in mA)
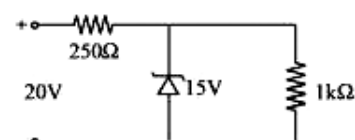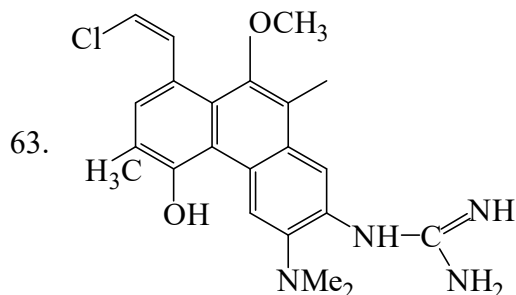

Space for rough work

54. A body of mass 1 kg is thrown upwards with a velocity 20 m/s. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction? ($g = 10$ m/s²) (in J)

55. Two particles which are initially at rest, move towards each other under the action of their internal attraction. If their speeds are v and 2v at any instant, then the speed of centre of mass of the system will be:
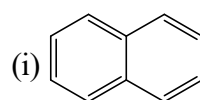
PART B: CHEMISTRY

56. The minimum mass (in g) of $CaCO_3$ required to establish the equilibrium:

$$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g), K_C = 0.05\,M$$

at a certain temperature in a 1.0 L container is

57. The equivalent weight of Br_2 is 96 in the following disproportionation reaction.

$$Br_2 + OH^- \rightarrow Br^- + H_2O + ? \text{ (Oxidized product)}$$

The oxidation state of Br in the oxidized product is ($Br = 80$)

58. When 0.05 mole of HCl is added in 200 ml of a buffer solution, the pH of the solution decreases by 0.05 unit. What is the buffer capacity of the solution?

59. An aqueous solution has a density of 1.37 g/ml. If molecular wt of solute is 68.5 g/mol, then calculate molarity of solution.

60. The compound MX_6 is octahedral. Find the number of 90° $X - M - X$ angles in compounds

61. Find the total number of possible isomers of $[CrCl_3(NH_3)_3]$.

62. How many metals are commercially reduced by Goldschmidt alumic process from the given metals?
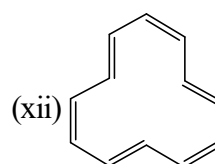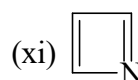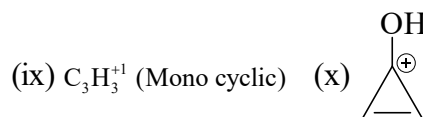Na, Pb, Al, Mn, Cr, Sn

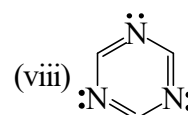63.

Find out number of delocalised non bonding electron in following molecule

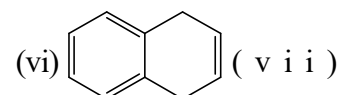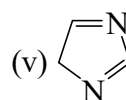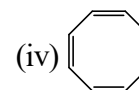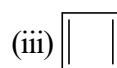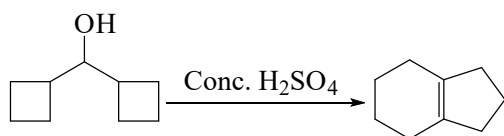64. Among the following compounds, number of compounds which are aromatic are:

(i)

(ii) $C_8H_8^{-2}$ (Mono cyclic)

(iii)

(iv)

(v)

(vi)

(v i i)

(viii)

(ix) $C_3H_3^{+1}$ (Mono cyclic)

(x)

(xi)

(xii)
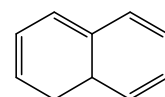
65. How many 1,2 shift are possible during rearrangement of carbocation in following reaction ?

PART C: MATHEMATICS

66. The minimum value of the function

$$f(x) = \frac{\tan\left(x + \frac{\pi}{6}\right)}{\tan x} \text{ is:}$$

67. Number of principal solution(s) of the equation,
$$4 \cdot 16^{\sin^2 x} = 2^{6 \sin x}, \text{ is}$$

68. If $(1 + x - 3x^2)^{2145} = a_0 + a_1 x + a_2 x^2 + \ldots\ldots$ then $a_0 - a_1 + a_2 - a_3 + \ldots$ ends with

69. Water is drained from a vertical cylindrical tank by opening a valve at the base of the tank. It is known that the rate at which the water level drops is proportional to the square root of water depth y, where the constant of proportionality $k > 0$ depends on the acceleration due to gravity and the geometry of the hole. If t is measured in minutes and $k = \frac{1}{15}$ then the time to drain the tank if the water is 4 meter deep to start with is

70. Three balls marked 1, 2 and 3 are placed in an urn. One ball is drawn, its number is recorded, then the ball is returned to the urn. This process is repeated and then repeated once more, and each ball is equally likely to be drawn on each occasion. If the sum of the numbers recorded is 6, the probability that the ball numbered 2 was drawn at all the three occassions, is $\frac{m}{n}$ then m.n is

71. If A, B and C are $n \times n$ matrices and det(A) = 2, det(B) = 3 and det(C) = 5, then the value of the det(A^2BC^{-1}) is equal to $\frac{a}{b}$ then a + b is

72. For $f(x) = x^4 + |x|$, let $I_1 = \int\limits_0^{\pi} f(\cos x)dx$ and $I_2 = \int\limits_0^{\pi/2} f(\sin x)dx$ then $\frac{I_1}{I_2}$ has the value equal to

73. Number of value of x satisfying the equation $\sin^{-1}\left(\frac{5}{x}\right) + \sin^{-1}\left(\frac{12}{x}\right) = \frac{\pi}{2}$ is

74. Let $P(x) = kx^3 + 2k^2x^2 + k^3$. The sum of all real numbers k for which x – 2 is a factor of P(x).

75. Consider the two statements

Statement-1: $y = \sin kt$ satisfies the differential equation $y'' + 9y = 0$.

Statement-2: $y = e^{kt}$ satisfy the differential equation $y'' + y' - 6y = 0$

The value of |k| for which both the statements are correct is

Space for rough work

ANSWER KEY

01.	(2)	02.	(4)	03.	(3)	04.	(1)	05.	(2)	06.	(1)	07.	(1)
08.	(3)	09.	(4)	10.	(4)	11.	(3)	12.	(4)	13.	(3)	14.	(4)
15.	(3)	16.	(4)	17.	(1)	18.	(4)	19.	(3)	20.	(1)	21.	(3)
22.	(1)	23.	(2)	24.	(4)	25.	(3)	26.	(1)	27.	(1)	28.	(3)
29.	(4)	30.	(1)	31.	(4)	32.	(2)	33.	(1)	34.	(2)	35.	(4)
36.	(1)	37.	(1)	38.	(1)	39.	(4)	40.	(1)	41.	(1)	42.	(3)
43.	(1)	44.	(3)	45.	(3)	46.	(50)	47.	(60)	48.	(3)	49.	(12)
50.	(75)	51.	(5)	52.	(5)	53.	(5)	54.	(20)	55.	(0)	56.	(5)
57.	(5)	58.	(5)	59.	(20)	60.	(12)	61.	(2)	62.	(2)	63.	(10)
64.	(6)	65.	(4)	66.	(3)	67.	(3)	68.	(3)	69.	(60)	70.	(7)
71.	(17)	72.	(2)	73.	(1)	74.	(8)	75.	(3)				

For any correction or query related to answer key, contact +91 81262 61333

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