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06-April-2023 (Morning Batch) : JEE Main Paper

MATHEMATICS **Section - A (Single Correct Answer)**

1. Let $5f(x)+4f\left(\frac{1}{x}\right)=\frac{1}{x}+3,\ x>0$. Then $18\int_1^2 f(x)dx$ is equal to :

(A) $10\log_e 2-6$ (B) $10\log_e 2+6$ (C) $5\log_e 2+3$ (D) $5\log_e 2-3$

2. A pair of dice is thrown 5 times. For each throw, a total of 5 is considered a success. If the probability of at least 4 successes is $\frac{k}{3^{11}}$, then k is equal to

(A) 82 (B) 123 (C) 164 (D) 75

3. If ${}^{2n}C_3 : {}^{n}C_3 = 10 : 1$, then the ratio $(n^2 + 3n) : (n^2 - 3n + 4)$ is

(A) 35 : 16 (B) 65 : 37 (C) 27 : 11 (D) 2 : 1

4. If the ratio of the fifth term from the begining to the fifth term from the end in the expansion of $\left(\sqrt[4]{2}+\frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6}:1$, then the third term from the beginning is :

(A) $60\sqrt{2}$ (B) $60\sqrt{3}$ (C) $30\sqrt{2}$ (D) $30\sqrt{3}$

5. Let $\vec{a}=2\hat{i}+3\hat{j}+4\hat{k}$, $\vec{b}=2\hat{i}-2\hat{j}-2\hat{k}$ and $\vec{c}=-\hat{i}+4\hat{j}+3\hat{k}$. If $\vec{d}$ is a vector perpendicular to both $\vec{b}$ and $\vec{c}$ and $\vec{a}\cdot\vec{d}=18$. Then $|\vec{a}\times\vec{d}|^2$ is equal to :

(A) 640 (B) 760 (C) 680 (D) 720

6. The straight lines l_1 and l_2 pass through the origin and trisect the line segment of the line L : 9x + 5y = 45 between the axes. If m_1 and m_2 are the slopes of the lines l_1 and l_2, then the point of intersection of the line $y = (m_1 + m_2)x$ with L lies on

(A) 6x + y = 10 (B) 6x – y = 15 (C) y – x = 5 (D) y – 2x = 5

7. From the top A of a vertical wall AB of height 30 m, the angles of depression of the top P and bottom Q of a vertical tower PQ are 15° and 60° respectively. B and Q are on the same horizontal level. If C is a point on AB such that CB = PQ, then the area (in m^2) of the quadrilateral BCPQ is equal to

(A) $600(\sqrt{3}-1)$ (B) $300(\sqrt{3}+1)$

(C) $200(3-\sqrt{3})$ (D) $300(\sqrt{3}-1)$

8. The sum of the first 20 terms of the series 5 +11 + 19+ 29 + 41 + ... is

(A) 3450 (B) 3250 (C) 3420 (D) 3520

9. The mean and variance of a set of 15 numbers are 12 and 14 respectively. The mean and variance of another set of 15 numbers are 14 and σ^2 respectively. If the variance of all the 30 numbers in the two sets is 13, then σ^2 is equal to

(A) 9 (B) 12 (C) 11 (D) 10

10. Let $A = [a_{ij}]_{2\times 2}$ where $a_{ij} \neq 0$ for all i, j and $A^2 = I$. Let 'a' be the sum of all diagonal elements of A and b = |A|, then $3a^2 + 4b^2$ is equal to

(A) 7 (B) 14 (C) 3 (D) 4

11. Let $I(x) = \int \frac{x^2(x\sec^2 x + \tan x)}{(x\tan x + 1)^2}dx$. If I(0) = 0 then $I\left(\frac{\pi}{4}\right)$ is equal to

(A) $\log_e \frac{(x+4)^2}{16} - \frac{\pi^2}{4(\pi+4)}$ (B) $\log_e \frac{(x+4)^2}{16} + \frac{\pi^2}{4(\pi+4)}$

(C) $\log_e \frac{(x+4)^2}{32} - \frac{\pi^2}{4(\pi+4)}$ (D) $\log_e \frac{(x+4)^2}{32} + \frac{\pi^2}{4(\pi+4)}$

12. If the equation of the plane passing through the line of intersection of the planes $2x - y + z = 3$, $4x - 3y + 5z + 9 = 0$ and parallel to the line $\frac{x+1}{-2} = \frac{y+3}{4} = \frac{z-2}{5}$ is $ax + by + cz + 6 = 0$. then a + b + c is equal to

(A) 14 (B) 12 (C) 13 (D) 15

13. Statement $(P \Rightarrow Q) \wedge (R \Rightarrow Q)$ is logically equivalent to

(A) $(P \vee R) \Rightarrow Q$ (B) $(P \Rightarrow R) \wedge (Q \Rightarrow R)$

(C) $(P \Rightarrow R) \vee (Q \Rightarrow R)$ (D) $(P \wedge R) \Rightarrow Q$

14. The sum of all the roots of the equation $|x^2 - 8x + 15| - 2x + 7 = 0$ is :

(A) $9+\sqrt{3}$ (B) $11+\sqrt{3}$ (C) $9-\sqrt{3}$ (D) $11-\sqrt{3}$

15. Let $a_1, a_2, a_3 .... a_n$ be n positive consecutive terms of an arithmetic progression. If d > 0 is its common difference, then $\lim_{n\to\infty} \sqrt{\frac{d}{n}}\left(\frac{1}{\sqrt{a_1}+\sqrt{a_2}} + \frac{1}{\sqrt{a_2}+\sqrt{a_3}} + ... + \frac{1}{\sqrt{a_{n-1}}+\sqrt{a_n}}\right)$ is equal to

(A) 1 (B) $\sqrt{d}$ (C) $\frac{1}{\sqrt{d}}$ (D) 0

16. If the system of equations

$x + y + az = b$ $2x + 5y + 2z = 6$ $x + 2y + 3z = 3$

has infinitely many solutions, then 2a + 3b is equal to

(A) 23 (B) 28 (C) 25 (D) 20

17. If $2x^y + 3y^x = 20$, then $\frac{dy}{dx}$ at (2, 2) is equal to

(A) $-\left(\frac{3+\log_e 8}{2+\log_e 4}\right)$ (B) $-\left(\frac{2+\log_e 8}{3+\log_e 4}\right)$ (C) $-\left(\frac{3+\log_e 16}{4+\log_e 8}\right)$ (D) $-\left(\frac{3+\log_e 4}{2+\log_e 8}\right)$

18. One vertex of a rectangular parallelopiped is at the origin O and the lengths of its edges along x, y and z axes are 3, 4 and 5 units respectively. Let P be the vertex (3, 4, 5). Then the shortest distance between the diagonal OP and an edge parallel to z axis, not passing through O or P is :

(A) $\frac{12}{\sqrt{5}}$ (B) $\frac{12}{5\sqrt{5}}$ (C) $12\sqrt{5}$ (D) $\frac{12}{5}$

19. Let the position vectors of the points A, B, C and D be $5\hat{i}+5\hat{j}+2\lambda\hat{k}$, $\hat{i}+2\hat{j}+3\hat{k}$, $-2\hat{i}+\lambda\hat{j}+4\hat{k}$ and $-\hat{i}+5\hat{j}+6\hat{k}$. Let the set $S=\{\lambda\in\mathbb{R}:$ The points A, B, C & D are coplanar$\}$. Then $\sum_{\lambda\in S}(\lambda+2)^2$ is equal to

(A) 41 (B) 25 (C) 13 (D) $\frac{37}{2}$

20. Let $A=\{x\in\mathbb{R}:[x+3]+[x+4]\le 3\}$, $B=\left\{x\in\mathbb{R}:3^x\left(\sum_{r=1}^{\infty}\frac{3}{10^r}\right)^{x-3}<3^{-3x}\right\}$, where [t] denotes greatest integer function. Then,

(A) $A\cap B=\phi$ (B) $A=B$ (C) $B\subset C,\ A\neq B$ (D) $A\subset B,\ A\neq B$

SECTION - B

21. Let $a\in Z$ and [t] be the greatest integer $\le t$. Then the number of points, where the function f(x) = [a + 13 sin x], $x\in(0,\ \pi)$ is not differentiable, is ____

22. A circle passing through the point P (α, β) in the first quadrant touches the two coordinate axes at the points A and B. The point P is above the line AB. The point Q on the line segment AB is the foot of perpendicular from P on AB. If PQ is equal to 11 units, then the value of $\alpha\beta$ is _____

23. The number of ways of giving 20 distinct oranges to 3 children such that each child gets atleast one orange is _____

24. If the area of the region $S=\{(x,\ y):2y-y^2\le x^2\le 2y,\ x\ge y\}$ is equal to $\frac{n+2}{n+1}-\frac{\pi}{n-1}$, then the natural number n is equal to ____

25. Let the point (p, p + 1) lie inside the region $E=\{(x,\ y):3-x\le y\le\sqrt{9-x^2},\ 0\le x\le 3\}$. If the set of all values of p is the interval (a, b), then $b^2 + b - a^2$ is equal to ____

26. Let y = y(x) be a solution of the differential equation $(x\cos x)dy + (xy\sin x + y\cos x - 1)dx = 0$, $0<x<\frac{\pi}{2}$.

If $\frac{\pi}{3}y\left(\frac{\pi}{3}\right)=\sqrt{3}$, then $\left|\frac{\pi}{6}y''\left(\frac{\pi}{6}\right)+2y'\left(\frac{\pi}{6}\right)\right|$ is equal to _____

27. The coefficient of x^{18} in the expansion of $\left(x^4-\frac{1}{x^3}\right)^{15}$ is ___

28. Let A = {1, 2, 3, 4,....10} and B = {0, 1, 2, 3, 4}. The number of elements in the relation R = {(a, b) $\in$ A $\times$ A : $2(a-b)^2 + 3(a-b) \in$ B} is _____

29. Let the image of the point P(l, 2, 3) in the plane 2x – y + z = 9 be Q. If the coordinates of the point R are (6, 10, 7), then the square of the area of the triangle PQR is ____

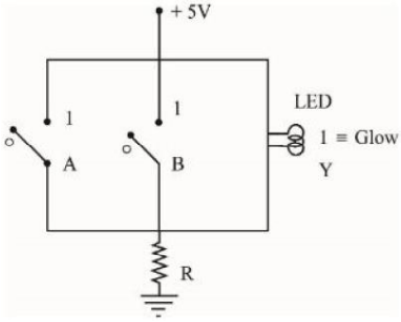
30. Let the tangent to the curve $x^2 + 2x - 4y + 9 = 0$ at the point P(1, 3) on it meets the y-axis at A. Let the line passing through P and parallel to the line x – 3y = 6 meet the parabola $y^2 = 4x$ at B. If B lies on the line 2x – 3y = 8. then $(AB)^2$ is equal to

PHYSICS **Section - A (Single Correct Answer)**

31. For the plane electromagnetic wave given by $E = E_0 \sin(\omega t - kx)$ and $B = B_0 \sin(\omega t - kx)$, the ratio of average electric energy density to average magnetic energy density is

(A) 1 (B) 1/2 (C) 2 (D) 4

32. Name the logic gate equivalent to the diagram attached



(A) OR (B) NOR (C) NAND (D) AND

33. A small ball of mass M and density ρ is dropped in a viscous liquid of density ρ_0. After some time, the ball falls with a constant velocity. What is the viscous force on the ball ?

(A) $F = Mg\left(1 - \frac{\rho_0}{\rho}\right)$ (B) $F = Mg\left(1 + \frac{\rho}{\rho_0}\right)$

(C) $F = Mg\left(1 + \frac{\rho_0}{\rho}\right)$ (D) $F = Mg\left(1 \pm \rho\rho_0\right)$

34. The number of air molecules per cm^3 increased from 3×10^{19} to 12×10^{19}. The ratio of collision frequency of air molecules before and after the increase in number respectively is

(A) 1.25 (B) 0.25 (C) 0.75 (D) 0.50

35. A source supplies heat to a system at the rate of 1000 W. If the system performs work at a rate of 200 W. The rate at which internal energy of the system increases

(A) 1200 W (B) 600 W (C) 500 W (D) 800 W

36. A particle is moving with constant speed in a circular path. When the particle turns by an angle 90°, the ratio of instantaneous velocity to its average velocity is $\pi : x\sqrt{2}$. The value of x will be

(A) 2 (B) 5 (C) 1 (D) 7

37. A small block of mass 100 g is tied to a spring of spring constant 7.5 N/m and length 20 cm. The other end of spring is fixed at a particular point A. If the block moves in a circular path on a smooth horizontal surface with constant angular velocity 5 rad/s about point A, then tension in the spring is

(A) 1.5 N (B) 0.75 N

(C) 0.25 N (D) 0.50 N

38. A monochromatic light wave with wavelength λ_1 and frequency v_1 in air enters another medium. If the angle of incidence and angle of refraction at the interface are 45° and 30° respectively, then the wavelength λ_2 and frequency v_2 of the refracted wave are :

(A) $\lambda_2 = \lambda_1, v_2 = \sqrt{2}v_1$ (B) $\lambda_2 = \frac{1}{\sqrt{2}}\lambda_1, v_2 = v_1$

(C) $\lambda_2 = \sqrt{2}\lambda_1, v_2 = v_1$ (D) $\lambda_2 = \lambda_1, v_2 = \frac{1}{\sqrt{2}}v_1$

39. Given below are two statements : one is labelled as

Assertion A and the other is labelled as **Reason R**.

Assertion A : When a body is projected at an angle 45°, it's range is maximum.

Reason R : For maximum range, the value of sin 2θ should be equal to one.

In the light of the above statements, choose the **correct** answer from the options given below :

(A) Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**

(B) Both **A** and **R** are correct **R** is the correct explanation of **A**

(C) **A** is true but **R** is false

(D) **A** is false but **R** is true

40. Two resistances are given as $R_1 = (10 \pm 0.5)\Omega$ and $R_2 = (15 \pm 0.5)\Omega$. The percentage error in the measurement of equivalent resistance when they are connected in parallel is

(A) 6.33 (B) 2.33 (C) 4.33 (D) 5.33

41. A planet has double the mass of the earth. Its average density is equal to the that of the earth. An object weighing W on earth will weigh on that planet :

(A) $2^{2/3}$ W (B) W (C) $2^{1/3}$ W (D) 2 W

42. Given below are two statements : one is labelled as

Assertion A and the other is labelled as **Reason R**.

Assertion A : Earth has atmosphere whereas moon doesn't have any atmosphere.

Reason R : The escape velocity on moon is very small as compared to that on earth.

In the light of the above statement, choose the correct answer from the options given below :

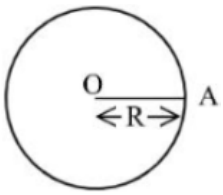
(A) A is true but R is false

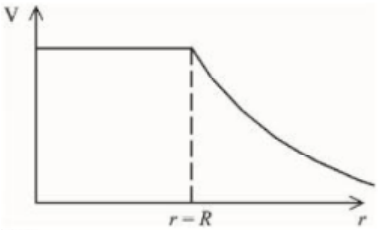
(B) A is false but R is true

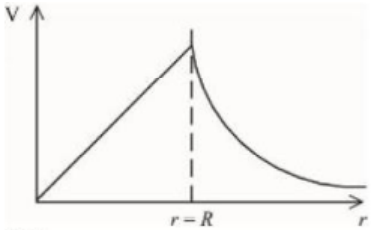
(C) Both A and R are correct but R is NOT the correct explanation of A

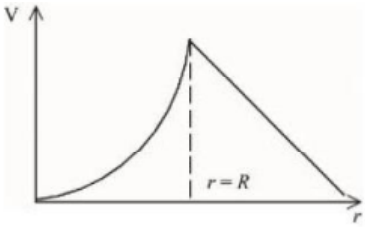
(D) Both A and R are correct and R is correct explanation of A

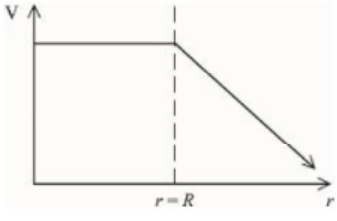
43. For a uniformly charged thin spherical shell, the electric potential (V) radially away from the center (O) of shell can be graphically represented as



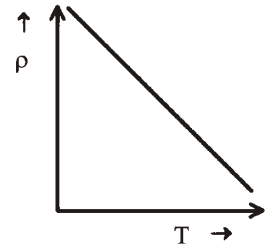
(A)


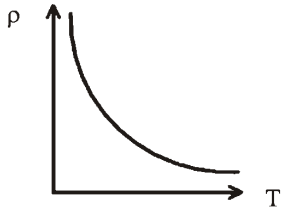
(B)


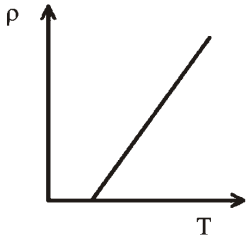
(C)


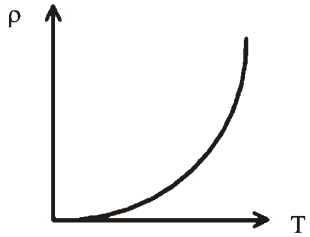
(D)


44. The resistivity (ρ) of semiconductor varies with temperature. Which of the following curve represents the correct behaviour

(A) 

(B) 

(C) 

(D) 

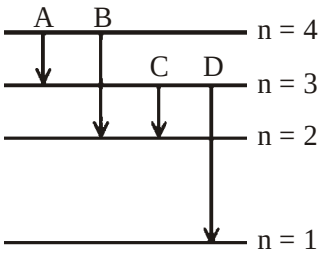
45. The kinetic energy of an electron, α-particle and a proton are given as 4K, 2K and K respectively. The de-Broglie wavelength associated with electron (λe) α-particle (λα) and the proton (λp) are as follows :

(A) $\lambda\alpha = \lambda p < \lambda e$ (B) $\lambda\alpha > \lambda p < \lambda e$ (C) $\lambda\alpha < \lambda p < \lambda e$ (D) $\lambda\alpha = \lambda p > \lambda e$

46. By what percentage will the transmission range of a TV tower be affected when the height of the tower is increased by 21% ?

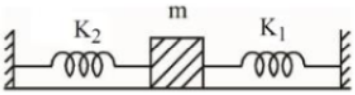
(A) 14% (B) 12% (C) 10% (D) 15%

47. The energy levels of an hydrogen atom are shown below. The transition corresponding to emission of shortest wavelength is



(A) C (B) D (C) B (D) A

48. A mass m is attached to two springs as shown in figure. The spring constants of two springs are K_1 and K_2. For the frictionless surface, the time period of oscillation of mass m is



(A) $\frac{1}{2\pi}\sqrt{\frac{K_1+K_2}{m}}$ (B) $\frac{1}{2\pi}\sqrt{\frac{K_1-K_2}{m}}$ (C) $2\pi\sqrt{\frac{m}{K_1+K_2}}$ (D) $2\pi\sqrt{\frac{m}{K_1-K_2}}$

49. The induced emf can be produced in a coil by

A. moving the coil with uniform speed inside magnetic field

B. moving the coil with non-uniform speed inside uniform magnetic field

C. rotating the coil inside the uniform magnetic field

D. changing the area of the coil inside the uniform magnetic field

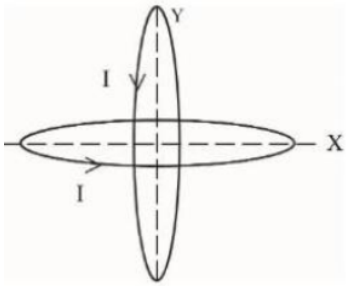
Choose the correct answer from the options given below:

(A) B and D only (B) B and C only (C) A and C only (D) C and D only

50. A long straight wire of circular cross-section (radius a) is carrying steady current I. The current I is uniformly distributed across this cross-section. The magnetic field is
(A) Zero in the region r < a and inversely proportional to r in the region r > a
(B) Inversely proportional to r in the region r < a and uniform throughout in the region r > a
(C) Directly proportional to r in the region r < a and inversely proportional to r in the region r > a
(D) Uniform in the region r < a and inversely proportional to distance r from the axis, in the region r > a

SECTION - B

51. A pole is vertically submerged in swimming pool, such that it gives a length of shadow 2.15 m within water when sunlight is incident at an angle of 30° with the surface of water. If swimming pool is filled to a height of 1.5 m, then the height of the pole above the water surface in centimetres is (n_w = 4/3) _____ .
52. The length of a metallic wire is increased by 20% and its area of cross section is reduced by 4%. The percentage change in resistance of the metallic wire is _____ .
53. A particle of mass 10 g moves in a straight line with retardation 2x, where x is the displacement in SI units. Its loss of kinetic energy for above displacement is $\left(\frac{10}{x}\right)^{-n}$ J. The value of n will be _____ .
54. Two identical circular wires of radius 20 cm and carrying current A are placed in perpendicular planes as shown in figure. The net magnetic field at the centre of the circular wire is _____ × 10^{-8} T. (Take π = 3.14)



55. A person driving car at a constant speed of 15 m/s is approaching a vertical wall. The person notices a change of 40 Hz in the frequency of his car's horn upon reflection from the wall. The frequency of horn is _____ Hz. (Given : Speed of sound : 330 m/s)
56. The radius of fifth orbit of the Li^{++} is _____ × 10^{-12}m. Take : radius of hydrogen atom = 0.51Å
57. A steel rod has a radius of 20 mm and a length of 2.0 m. A force of 62.8 kN stretches it along its length. Young's modulus of steel is 2.0 × 10^{11} N/m^2. The longitudinal strain produced in the wire is _____ × 10^{-5}.
58. An ideal transformer with purely resistive load operates at 12 kV on the primary side. It supplies electrical energy to a number of nearby houses at 120 V. The average rate of energy consumption in the houses served by the transformer is 60 kW. The value of resistive load (Rs) required in the secondary circuit will be _____ mΩ.
59. Two identical solid spheres each of mass 2 kg and radii 10 cm are fixed at the ends of a light rod. The separation between the centres of the spheres is 40 cm. The moment of inertia of the system about an axis perpendicular to the rod passing through its middle point is _____ × 10^{-3} kg-m^2
60. A parallel plate capacitor with plate area A and plate separation d is filled with a dielectric material of dielectric constant K = 4. The thickness of the dielectric material is x, where x < d.

Let C_1 and C_2 be the capacitance of the system for $x = \frac{1}{3}d$ and $x = \frac{2d}{3}$, respectively. If C_1 = 2μF the value of C_2 is _____ μF.

CHEMISTRY **Section - A (Single Correct Answer)**

61. A compound is formed by two elements X & Y. The element Y forms cubic close packed arrangement and those of element X occupy one third of the tetrahedral voids. What is the formula of the compound ?

(A) X_2Y_3 (B) X_3Y (C) X_3Y_2 (D) XY_3

62. Match List I with List II.

	List I Element detected		List II Reagent used / Product formed
A	Nitrogen	I.	$Na_2[Fe(CN)_5NO]$
B	Sulphur	II.	$AgNO_3$
C	Phosphorous	III.	$Fe_4[Fe(CN)_6]_3$
D	Halogen	IV.	$(NH_4)_2MoO_4$

Choose the correct answer from the options given below :

(A) A-II, B-IV, C-I, D-III (B) A-IV, B-II, C-I, D-III

(C) A-II, B-I, C-IV, D-III (D) A-III, B-I, C-IV, D-II

63. The standard electrode potential of M^+/M in aqueous solution does not depend on –

(A) Ionisation of a solid metal atom (B) Sublimation of a solid metal

(C) Ionisation of a gaseous metal atom (D) Hydration of a gaseous metal ion

64. Polymer used in orlon is :

(A) Polyacrylonitrile (B) Polyethene (C) Polycarbonate (D) Polyamide

65. The difference between electron gain enthalpies will be maximum between :

(A) Ne and F (B) Ne and Cl (C) Ar and Cl (D) Ar and F

66. Match List I with List II

	List I (Enzymatic reaction)		List II (Enzyme)
A	Sucrose $\rightarrow$ Glucose and Fructose	I.	Zymase
B	Glucose $\rightarrow$ Methyl alcohol and CO_2	II.	Pepsin
C	Starch $\rightarrow$ Maltose	III.	Invertase
D	Proteins $\rightarrow$ Amino acids	IV.	Diastase

Choose the correct answer from the options given below –

(A) A-III, B-I, C-II, D-IV (B) A-I, B-IV, C-III, D-II

(C) A-III, B-I, C-IV, D-II (D) A-I, B-II, C-IV, D-III

67. The possibility of photochemical smog formation is more at –

(A) The places with healthy vegetation (B) Himalayan villages in winter

(C) Marshy lands (D) Industrial areas

68. The setting time of Cement is increased by adding

(A) Clay (B) Silica (C) Limestone (D) Gypsum

69. Given below are two statements: one is labelled as assertion and the other is labelled as reason.

Assertion : Loss of electron from hydrogen atom results in nucles of ~1.5×10^{-3} pm size.

Reason : Proton (H^+) always exists in combined form

In the light of the above statements, choose the most appropriate answer from the options given below.

(A) Both A and R are correct and R is the correct explanation of A

(B) A is correct but R is not correct

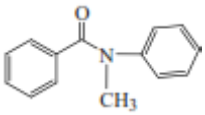
(C) A is not correct but R is correct

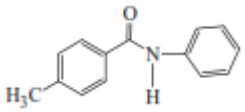
(D) Both A and R are correct but R is NOT the correct explanation of A

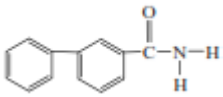
70. Compound P (M.F. $C_{14}H_{13}ON$) $\xrightarrow{HCl, \Delta}$ Filter → Residue Q; Filtrate $\xrightarrow{NaOH}$ Oily Liquid R.

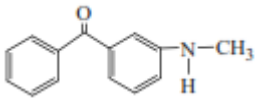
M.F = MOLECULAR FORMULA

Compound P is neutral. Q gives effervescence with $NaHCO_3$ while R reacts with Hinsbergs reagent to give solid soluble in NaOH. Compound P is

(A) 

(B) 

(C) 

(D) 

71. Match List I with List II :

	List I (Name of reaction)		List II (Reagent used)
A.	Hell-Volhard- Zelinsky reaction	I.	$NaOH + I_2$
B.	Iodoform reaction	II.	(i) CrO_2Cl_2, CS_2 (ii) H_2O
C.	Etard reaction	III.	(i) Br_2/red phosphorus (ii) H_2O
D.	Gatterman-Koch reaction	IV.	CO, HCl, anhyd. $AlCl_3$

Choose the correct answer from the options given below –

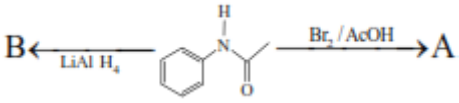
(A) A-III, B-II, C-I, D-IV

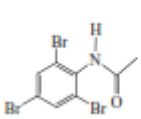
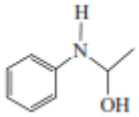
(B) A-III, B-I, C-IV, D-II

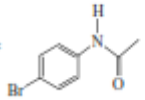
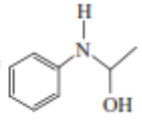
(C) A-I, B-II, C-III, D-IV

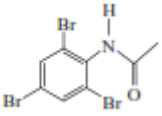
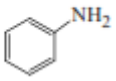
(D) A-III, B-I, C-II, D-IV

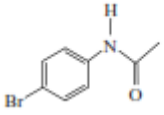
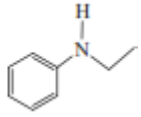
72. The major products A and B from the following reactions are :



(A) A =  B = 

(B) A =  B = 

(C) A =  B = 

(D) A =  B = 

73. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : The spin only magnetic moment value for $[Fe(CN)_6]^{3-}$ is 1.74 BM, whereas for $[Fe(H_2O)_6]^{3+}$ is 5.92 BM.

Reason R : In both complexes, Fe is present in +3 oxidation state.

In the light of the above statements, choose the correct answer from the options given below –

(A) Both A and R are true but R is NOT the correct explanation of A

(B) A is false but R is true

(C) A is true but R is false

(D) Both A and R are true and R is the correct explanation of A

74. Match List I with List II

	List I (Vitamin)		List II (Deficiency disease)
A	Vitamin A	I.	Beri-Beri
B	Thiamine	II.	Cheilosis
C	Ascorbic acid	III.	Xeropthalmia
D	Riboflavin	IV.	Scurvy

Choose the correct answer from the options given below –

(A) A-IV, B-II, C-III, D-I (B) A-III, B-II, C-IV, D-I

(C) A-IV, B-I, C-III, D-II (D) A-III, B-I, C-IV, D-II

75. Which of the following options are correct for the reaction

$2[Au(CN)_2]^-(aq) + Zn(s) \rightarrow 2Au(s) + [Zn(CN)_4]^{2-}(aq)$

A. Redox reaction **B.** Displacement reaction

C. Decomposition reaction **D.** Combination reaction

Choose the correct answer from the options given below –

(A) A and B only (B) A only (C) C and D only (D) A and D only

76. Match List I with List II

	List I (Oxide)		List II (Type of Bond)
A	N_2O_4	I.	1 N = O bond
B	NO_2	II.	1 N – O – N bond
C	N_2O_5	III.	1 N – N bond
D	N_2O	IV.	1 N = N / N ≡ N bond

Choose the correct answer from the options given below –

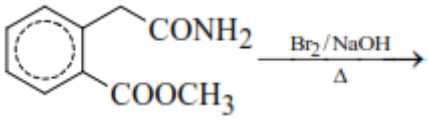
(A) A-II, B-IV, C-III, D-I (B) A-II, B-I, C-III, D-IV

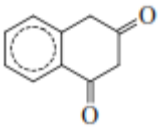
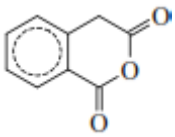
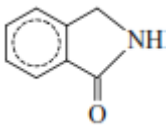
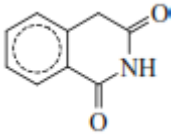
(C) A-III, B-I, C-IV, D-II (D) A-III, B-I, C-II, D-IV

77. Strong reducing and oxidizing agents among the following, respectively, are :

(A) Ce^{4+} and Eu^{2+} (B) Ce^{4+} and Tb^{4+} (C) Ce^{3+} and Ce^{4+} (D) Eu^{2+} and Ce^{4+}

78. The major product formed in the following reaction is –



(A)  (B)  (C)  (D) 

79. For a concentrated solution of a weak electrolyte (K_{eq} = equilibrium constant) A_2B_3 of concentration 'c', the degree of dissociation 'α' is

(A) $\left(\frac{K_{eq}}{108c^4}\right)^{\frac{1}{5}}$ (B) $\left(\frac{K_{eq}}{6c^5}\right)^{\frac{1}{5}}$ (C) $\left(\frac{K_{eq}}{5c^4}\right)^{\frac{1}{5}}$ (D) $\left(\frac{K_{eq}}{25c^2}\right)^{\frac{1}{5}}$

80. For the reaction,

$$RCH_2Br + I^- \xrightarrow{\text{Acetone}} \underset{\text{major}}{RCH_2I} + Br^-$$

The **correct** statement is :

(A) The transition state formed in the above reaction is less polar than the localised anion.

(B) The reaction can occur in acetic acid also.

(C) The solvent used in the reaction solvates the ions formed in rate determining step.

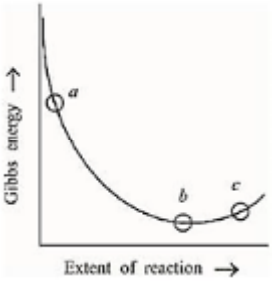
(D) Br^- can act as competing nucleophile.

SECTION - B

81. The wavelength of an electron of kinetic energy 4.50×10^{-29} J is ____ $\times 10^{-5}$ m.
(Nearest integer)
Given : Mass of electron is 9×10^{-31} kg, h = 6.6×10^{-34} J s

82. Number of bromo derivatives obtained on treating ethane with excess of Br_2, in diffused sunlight is ____.

83. Consider the graph of Gibbs free energy G *vs* Extent of reaction. The number of statement/s from the following which are true with respect to points (a), (b) and (c) is ____.



A. Reaction is spontaneous at (a) and (b)

B. Reaction is at equilibrium at point (b) and non-spontaneous at point (c)

C. Reaction is spontaneous at (a) and non-spontaneous at (c)

D. Reaction is non-spontaneous at (a) and (b)

84. Mass of Urea (NH_2CONH_2) required to be dissolved in 1000 g of water to reduce the vapour pressure of water by 25% is _____ g. (Nearest integer)
Given : Molar mass of N. C. O and H are 14. 12. 16 and 12 mol^{-1} respectively.

85. The value of log K for the reaction A $\leftrightharpoons$ B at 298 K is ____. (Nearest integer)
Given : $\Delta H^0 = -54.07$ kJ mol^{-1} ; $\Delta S° = 10$ JK^{-1} mol^{-1}
(Take : $2.303 \times 8.314 \times 298 = 5705$)

86. The number of species from the following which have square pyramidal structure is
PF_5, BrF_4^-, IF_5 ; BrF_5, $XeOF_4$, ICl_4^-

87. Number of ambidentate ligands in a representative metal complex $[M(en)(SCN)_4]$ is
[en = ethylenediamine]

88. For the adsorption of hydrogen on platinum, the activation energy is 30 kJ mol^{-1} and for the adsorption of hydrogen on nickel, the activation energy is 41.4 kJ mol^{-1}. The logarithm of the ratio of the rates of chemisorption on equal areas of the metals at 300 K is ____. (Nearest integer)
Given : ln 10 = 2.3 ; R = 8.3 JK^{-1} mol^{-1}

89. If 5 moles of $BaCl_2$ is mixed with 2 moles of Na_3PO_4, the maximum number of moles of $Ba_3(PO_4)_2$ formed is _____. (Nearest integer)

90. In ammonium-phosphomolybdate, the oxidation state of Mo is + ____.

❐ ❐ ❐

06-April-2023 (Morning Batch) : JEE Main Paper

ANSWER KEY

Mathematics

Single Choice Correct

1.	A	2.	B	3.	D	4.	B	5.	D
6.	C	7.	A	8.	D	9.	D	10.	D
11.	C	12.	A	13.	A	14.	A	15.	A
16.	A	17.	B	18.	D	19.	A	20.	B

Numerical Value

21.	25	22.	121	23.	171	24.	5	25.	3
26.	2	27.	5005	28.	18	29.	594	30.	292

Physics

Single Choice Correct

31.	A	32.	B	33.	A	34.	B	35.	D
36.	A	37.	B	38.	B	39.	B	40.	C
41.	C	42.	D	43.	A	44.	B	45.	C
46.	C	47.	B	48.	C	49.	D	50.	C

Numerical Value

51.	50	52.	25	53.	2	54.	628	55.	420
56.	425	57.	25	58.	240	59.	176	60.	3

Chemistry

Single Choice Correct

61.	A	62.	D	63.	A	64.	A	65.	B
66.	C	67.	D	68.	D	69.	D	70.	B
71.	D	72.	D	73.	A	74.	D	75.	A
76.	D	77.	D	78.	C	79.	A	80.	A

Numerical Value

81.	7	82.	9	83.	2	84.	1111	85.	10
86.	3	87.	4	88.	2	89.	1	90.	6