3S INSTITUTE
JEE ADVANCED | JEE MAIN | NEET | OLYMPIADS | MHT-CET | FOUNDATION

13-April-2023 (Evening Batch) : JEE Main Paper

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

1. If the system of equations

$2x + y - z = 5$ $2x - 5y + \lambda z = \mu$ $x + 2y - 5z = 7$

has infinitely many solutions, then $(\lambda + \mu)^2 + (\lambda - \mu)^2$ is equal to :

(A) 916 (B) 912 (C) 920 (D) 904

2. The coefficient of x^5 in the expansion of $\left(2x^3 - \frac{1}{3x^2}\right)^5$ is

(A) 8 (B) 9 (C) $\frac{80}{9}$ (D) $\frac{26}{3}$

3. The plane, passing through the points (0, –1, 2) and (–1, 2, 1) and parallel to the line passing through (5, 1, –7) and (1, –1, –1), also passes through the point

(A) (1, –2, 1) (B) (0, 5, –2) (C) (–2, 5, 0) (D) (2, 0, 1)

4. Let α, β be the roots of the equation $x^2 - \sqrt{2}x + 2 = 0$. Then $\alpha^{14} + \beta^{14}$ is equal to

(A) $-64\sqrt{2}$ (B) $-128\sqrt{2}$ (C) –64 (D) –128

5. Let $a_1, a_2, a_3, \ldots$ be a G.P. of increasing positive numbers. Let the sum of its 6th and 8th terms be 2 and the product of its 3rd and 5th terms be $\frac{1}{9}$. Then $6(a_2 + a_4)(a_4 + a_6)$ is equal to

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

6. Let (α, β) be the centroid of the triangle formed by the lines $15x - y = 82$, $6x - 5y = -4$ and $9x + 4y = 17$. Then $\alpha + 2\beta$ and $2\alpha - \beta$ are the roots of the equation

(A) $x^2 - 7x + 12 = 0$ (B) $x^2 - 13x + 42 = 0$
(C) $x^2 - 14x + 48 = 0$ (D) $x^2 - 10x + 25 = 0$

7. Let $|\vec{a}| = 2$, $|\vec{b}| = 3$ and the angle between the vectors $\vec{a}$ and $\vec{b}$ be $\frac{\pi}{4}$. Then $\left|(\vec{a} + 2\vec{b}) \times (2\vec{a} - 3\vec{b})\right|^2$ is equal to

(A) 482 (B) 441 (C) 841 (D) 882

8. Let N be the foot of perpendicular from the point P (1, –2, 3) on the line passing through the points (4, 5, 8) and (1, –7, 5). Then the distance of N from the plane $2x - 2y + z + 5 = 0$ is

(A) 6 (B) 9 (C) 7 (D) 8

9. If $\lim\limits_{x \to 0} \frac{e^{ax} - \cos(bx) - \frac{cxe^{-cx}}{2}}{1 - \cos(2x)} = 17$, then $5a^2 + b^2$ is equal to

(A) 72 (B) 76 (C) 68 (D) 64

10. Let the centre of a circle C be (α, β) and its radius $r < 8$. Let $3x + 4y = 24$ and $3x - 4y = 32$ be two tangents and $4x + 3y = 1$ be a normal to C. Then $(\alpha - \beta + r)$ is equal to

(A) 7 (B) 9 (C) 5 (D) 6

11. All words, with or without meaning, are made using all the letters of the word MONDAY. These words are written as in a dictionary with serial numbers. The serial number of the word MONDAY is

(A) 327 (B) 326 (C) 328 (D) 324

12. The range of $f(x) = 4\sin^{-1}\left(\frac{x^2}{x^2+1}\right)$ is

(A) $[0, \pi]$ (B) $[0, 2\pi)$ (C) $[0, \pi)$ (D) $[0, 2\pi]$

13. The statement $(p \wedge (\sim q) \vee ((\sim p) \wedge q) \vee ((\sim p) \wedge (\sim q))$ is equivalent to

(A) $(\sim p) \vee (\sim q)$ (B) $p \vee (\sim q)$

(C) $(\sim p) \vee q$ (D) $p \vee q$

14. The random variable X follows binomial distribution B (n, p) for which the difference of the mean and the variance is 1. If $2P(X = 2) = 3P(X = 1)$, then $n^2 P(X > 1)$ is equal to

(A) 12 (B) 15 (C) 11 (D) 16

15. Let for $A = \begin{bmatrix} 1 & 2 & 3 \\ a & 3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$, $|A| = 2$. If $|2\text{adj}(2\text{adj}(2A))| = 32^n$, then $3n + a$ is equal to

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

16. Let $S = \{z \in C : \bar{z} = i(z^2 + \text{Re}(\bar{z}))\}$. Then $\sum_{z \in S} |z|^2$ is equal to

(A) $\frac{7}{2}$ (B) 4 (C) $\frac{5}{2}$ (D) 3

17. The area of the region $\{(x, y) : x^2 \le y \le |x^2 - 4|, y \ge 1\}$ is

(A) $\frac{3}{4}(4\sqrt{2} - 1)$ (B) $\frac{4}{3}(4\sqrt{2} - 1)$ (C) $\frac{4}{3}(4\sqrt{2} + 1)$ (D) $\frac{3}{4}(4\sqrt{2} + 1)$

18. Let for a triangle ABC,

$\overrightarrow{AB} = -2\hat{i} + \hat{j} + 3\hat{k}$ $\overrightarrow{CB} = \alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$ $\overrightarrow{CA} = 4\hat{i} + 3\hat{j} + \delta\hat{k}$

If $\delta > 0$ and the area of the triangle ABC is $5\sqrt{6}$, then $\overrightarrow{CB} \cdot \overrightarrow{CA}$ is equal to

(A) 60 (B) 120 (C) 108 (D) 54

19. The line, that is coplanar to the line $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$, is

(A) $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-5}{5}$ (B) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$

(C) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ (D) $\frac{x-1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$

20. The value of $\dfrac{e^{-\frac{\pi}{4}}+\int_0^{\frac{\pi}{4}} e^{-x}\tan^{50}x\,dx}{\int_0^{\frac{\pi}{4}} e^{-x}(\tan^{49}x+\tan^{51}x)dx}$ is

(A) 50 (B) 49 (C) 51 (D) 25

SECTION - B

21. The mean and standard deviation of the marks of 10 students were found to be 50 and 12 respectively. Later, it was observed that two marks 20 and 25 were wrongly read as 45 and 50 respectively. Then the correct variance is _____.

22. Let A = {–4, –3, –2, 0, 1, 3, 4} and R = {(a, b) $\in$ A × A : b = |a| or $b^2 = a + 1$} be a relation on A. Then the minimum number of elements, that must be added to the relation R so that it becomes reflexive and symmetric, is_____.

23. Let $f(x)=\sum_{k=1}^{10} kx^k$, $x \in R$. If $2f(2) + f'(2) = 119(2)^n + 1$ then n is equal to_____.

24. Total number of 3-digit numbers that are divisible by 6 and can be formed by using the digits 1, 2, 3, 4, 5 with repetition, is____.

25. Let [α] denote the greatest integer $\le \alpha$. Then $[\sqrt{1}]+[\sqrt{2}]+[\sqrt{3}]+.....+[\sqrt{120}]$ is equal to

26. For $x \in (-1, 1]$, the number of solutions of the equation $\sin^{-1}x = 2\tan^{-1}x$ is equal to

27. If y = y (x) is the solution of the differential equation $\dfrac{dy}{dx}+\dfrac{4x}{(x^2-1)}y=\dfrac{x+2}{(x^2-1)^{\frac{5}{2}}}$, $x>1$ such that $y(2)=\dfrac{2}{9}\log_e(2+\sqrt{3})$ and $y(\sqrt{2})=\alpha\log_e(\sqrt{\alpha}+\beta)+\beta-\sqrt{\gamma}$, $\alpha, \beta, \gamma \in N$, then $\alpha\beta\gamma$ is equal to _____.

28. The foci of a hyperbola are (±2,0) and its eccentricity is $\dfrac{3}{2}$. A tangent, perpendicular to the line 2x + 3y = 6, is drawn at a point in the first quadrant on the hyperbola. If the intercepts made by the tangent on the x- and y-axes are 'a' and 'b' respectively, then |6a| + |5b| is equal to_____.

29. Let $f_n=\int_0^{\frac{\pi}{2}}\left(\sum_{k=1}^{n}\sin^{k-1}x\right)\left(\sum_{k=1}^{n}(2k-1)\sin^{k-1}x\right)\cos x\,dx$, $n \in N$. Then $f_{21} - f_{20}$ is equal to _____

30. The remainder when 7^{103} is divided by 17 is___.

PHYSICS Section - A (Single Correct Answer)

31. Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A : The binding energy per nucleon is practically independent of the atomic number for nuclei of mass number in the range 30 to 170.

Reason R : Nuclear force is short ranged.

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

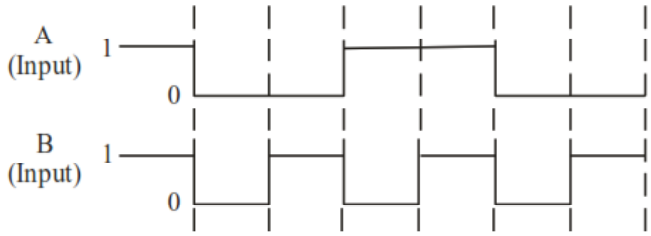
(A) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**

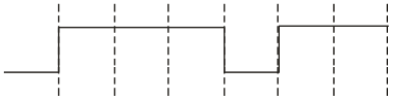
(B) **A** is true but **R** is false

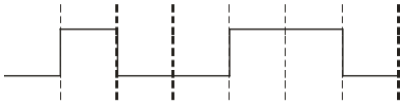
(C) **A** is false but **R** is true

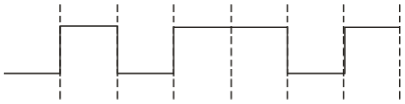
(D) Both **A** and **R** are true and **R** is the correct explanation of **A**

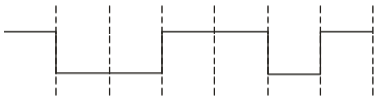
32. The output from a NAND gate having inputs A and B given below will be.



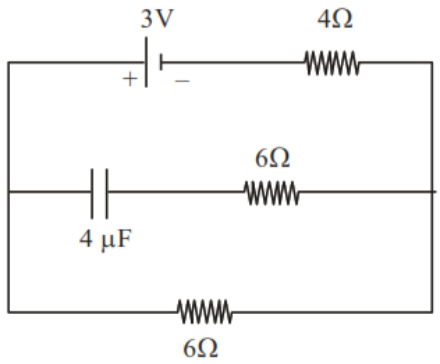
(A) 

(B) 

(C) 

(D) 

33. In the network shown below, the charge accumulated in the capacitor in steady state will be :



(A) 7.2 μC (B) 4.8 μC (C) 10.3 μC (D) 12 μC

34. Given below are two statements :

Statement I: For a planet, if the ratio of mass of the planet to its radius increases, the escape velocity from the planet also increases.

Statement II: Escape velocity is independent of the radius of the planet.

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

(A) Both Statement I and Statement II are incorrect

(B) Statement I is correct but statement II is incorrect

(C) Statement I is incorrect but statement II is correct

(D) Both Statement I and Statement II are correct

35. A particle executes SHM of amplitude A. The distance from the mean position when its's kinetic energy becomes equal to its potential energy is :

(A) $\sqrt{2A}$ (B) 2A (C) $\frac{1}{\sqrt{2}}A$ (D) $\frac{1}{2}A$

36. A passenger sitting in a train A moving at 90 km/h observes another train B moving in the opposite direction for 8 s. If the velocity of the train B is 54 km/h, then length of train B is :

(A) 80 m (B) 200 m (C) 120 m (D) 320 m

37. The initial pressure and volume of an ideal gas are P_0 and V_0. The final pressure of the gas when the gas is suddenly compressed to volume $V_0/4$ will be : (Given γ = ratio of specific heats at constant pressure and at constant volume)

(A) $P_0(4)^{\frac{1}{\gamma}}$ (B) $P_0(4)^{\gamma}$ (C) P_0 (D) $4P_0$

38. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A : A spherical body of radius (5 ± 0.1) mm having a particular density is falling through a liquid of constant density. The percentage error in the calculation of its terminal velocity is 4%.

Reason R : The terminal velocity of the spherical body falling through the liquid is inversely proportional to its radius.

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

(C) A is false but R is true

(D) A is true but R is false

39. In an electromagnetic wave, at an instant and at a particular position, the electric field is along the negative z-axis and magnetic field is along the positive x-axis. Then the direction of propagation of electromagnetic wave is :

(A) at 45° angle from positive y-axis (B) negative y-axis

(C) positive z-axis (D) positive y-axis

40. The distance travelled by an object in time t is given by $s = (2.5)t^2$. The instantaneous speed of the object at t = 5 s will be :

(A) 12.5 ms^{-1} (B) 62.5 ms^{-1} (C) 5 ms^{-1} (D) 25 ms^{-1}

41. An electron is moving along the positive x-axis. If the uniform magnetic field is applied parallel to the negative z-axis. then

A. The electron will experience magnetic force along positive y-axis

B. The electron will experience magnetic force along negative y-axis

C. The electron will not experience any force in magnetic field

D. The electron will continue to move along the positive x-axis

E. The electron will move along circular path in magnetic field

Choose the correct answer from the options given below :

(A) B and E only (B) A and E only

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

42. Two planets A and B of radii R and 1.5 R have densities ρ and ρ/2 respectively. The ratio of acceleration due to gravity at the surface of B to A is :

(A) 2 : 3 (B) 2 : 1 (C) 3 : 4 (D) 4 : 3

43. Given below are two statements:

Statement I : An AC circuit undergoes electrical resonance if it contains either a capacitor or an inductor.

Statement II : An AC circuit containing a pure capacitor or a pure inductor consumes high power due to its non-zero power factor.

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

(A) Both Statement I and Statement II are false (B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are true (D) Statement I is false but Statement II is true

44. A vehicle of mass 200 kg is moving along a levelled curved road of radius 70 m with angular velocity of 0.2 rad/s. The centripetal force acting on the vehicle is :

(A) 560 N (B) 2800 N (C) 14 N (D) 2240 N

45. To radiate EM signal of wavelength λ with high efficiency, the antennas should have a minimum size equal to :

(A) λ/2 (B) λ/4 (C) 2λ (D) λ

46. Given below are two statements:

Statement I : Out of microwaves, infrared rays and ultraviolet rays, ultraviolet rays are the most effective for the emission of electrons from a metallic surface.

Statement II : Above the threshold frequency, the maximum kinetic energy of photoelectrons is inversely proportional to the frequency of the incident light.

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

(A) Statement I is true but Statement II is false

(B) Both Statement I and Statement II are true

(C) Statement I is false but Statement II is true

(D) Both Statement I and Statement II are false

47. A 10 μC charge is divided into two parts and placed at 1 cm distance so that the repulsive force between them is maximum. The charges of the two parts are :

(A) 9 μC, 1 μC (B) 5 μC, 5 μC (C) 7 μC, 3 μC (D) 8 μC, 2 μC

48. In the equation $\left[X+\frac{a}{Y^2}\right]\left[Y-b\right]=RT$, X is pressure, Y is volume, R is universal gas constant and T is temperature. The physical quantity equivalent to the ratio a/b is :

(A) Energy (B) Impulse

(C) Pressure gradient (D) Coefficient of viscosity

49. In a Young's double slits experiment, the ratio of amplitude of light coming from slits is 2 : 1. The ratio of the maximum to minimum intensity in the interference pattern is :

(A) 9 : 4 (B) 9 : 1 (C) 2 : 1 (D) 25 : 9

50. The mean free path of molecules of a certain gas at STP is 1500d, where d is the diameter of the gas molecules. While maintaining the standard pressure, the mean free path of the molecules at 373K is approximately :

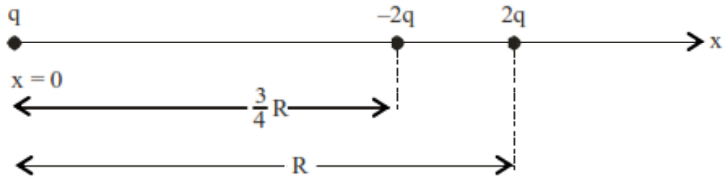
(A) 1098d (B) 2049d (C) 750d (D) 1500d

SECTION - B

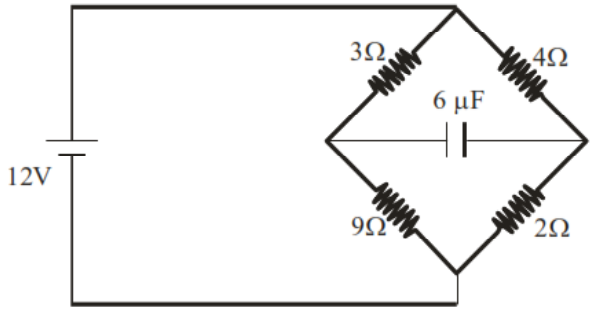
51. A bi convex lens of focal length 10 cm is cut in two identical parts along a plane perpendicular to the principal axis. The power of each lens after cut is _____ D.

52. An atom absorbs a photon of wavelength 500 nm and emits another photon of wavelength 600 nm. The net energy absorbed by the atom in this process is $n \times 10^{-4}$ eV. The value of n is _____.
[Assume the atom to be stationary during the absorption and emission process]
(Take $h = 6.6 \times 10^{-34}$ Js and $c = 3 \times 10^{8}$ m/s).

53. Three point charges q, –2q and 2q are placed on x-axis at a distance x = 0, $x = \frac{3}{4}$ R and x = R respectively from origin as shown. If $q = 2 \times 10^{-6}$ C and R = 2 cm, the magnitude of net force experienced by the charge –2q is _____ N.



54. In the circuit shown, the energy stored in the capacitor is n μJ. The value of n is _____.



55. An insulated copper wire of 100 turns is wrapped around a wooden cylindrical core of the crosssectional area 24 cm^2. The two ends of the wire are connected to a resistor. The total resistance in the circuit is 12 Ω. If an externally applied uniform magnetic field in the core along its axis changes from 1.5 T in one direction to 1.5 T in the opposite direction, the charge flowing through a point in the circuit during the change of magnetic field will be _____ mC.

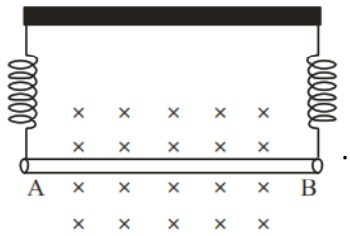
56. In an experiment with sonometer when a mass of 180 g is attached to the string, it vibrates with fundamental frequency of 30 Hz. When a mass m is attached, the string vibrates with fundamental frequency of 50 Hz. The value of m is _____g.

57. A light rope is wound around a hollow cylinder of mass 5 kg and radius 70 cm. The rope is pulled with a force of 52.5 N. The angular acceleration of the cylinder will be _____ rad s^{-2}.

58. A car accelerates from rest to u m/s. The energy spent in this process is E J. The energy required to accelerate the car from u m/s to 2u m/s is nE J. The value of n is _____.

59. Two plates A and B have thermal conductivities 84 $Wm^{-1} K^{-1}$ and 126 $Wm^{-1} K^{-1}$ respectively. They have same surface area and same thickness. They are placed in contact along their surfaces. If the temperatures of the outer surfaces of A and B are kept at 100°C and 0°C respectively, then the temperature of the surface of contact in steady state is _____ °C.

60. A straight wire AB of mass 40 g and length 50 cm is suspended by a pair of flexible leads in uniform magnetic field of magnitude 0.40 T as shown in the figure. The magnitude of the current required in the wire to remove the tension in the supporting leads is _____A. (Take g = 10 ms^{-2}).



CHEMISTRY Section - A (Single Correct Answer)

61. In the wet tests for detection of various cations by precipitation, Ba2+ cations are detected by obtaining precipitate of

(A) Ba(ox) : Barium oxalate (B) $BaCO_3$

(C) $Ba(OA)_2$ (D) $BaSO_4$

62. The naturally occurring amino acid that contains only one basic functional group in its chemical structure is

(A) arginine (B) lysine (C) asparagine (D) histidine

63. Given below are two statements related to Ellingham diagram:

Statement-I : Ellingham diagrams can be constmcted for fomiation of oxides, sulfides and halides of metals.

Statement-II : It consists of plots of $\Delta_f H^0$ vs T for fomiation of oxides of elements.

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

(A) Both Statement I and Statement II are incorrect

(B) Statement I is incorrect but Statement II is. correct

(C) Both Statement I and Statement II are correct

(D) Statement I is correct but Statement II is incorrect

64. Given below are two statements, one is labelled as

Assertion A and the other is labelled as Reason R.

Assertion A : The diameter of colloidal particles in solution should not be much smaller than wavelength of light to show Tyndall effect.

Reason R : The light scatters in all directions when the size of particles is large enough.

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

(A) A is tme but R is false

(B) A is false but R is tme

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

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

65. The total number of stereoisomers for the complex $[Cr(ox)_2 ClBr]^{3-}$ (where ox = oxalate) is :

(A) 2 (B) 3 (C) 1 (D) 4

66. Better method for preparation of BeF2, among the following is

(A) $(NH_4)_2 BeF_4 \xrightarrow{\Delta} BeF_2$ (B) $BeH_2 + F_2 \xrightarrow{\Delta} BeF_2$

(C) $Be + F_2 \xrightarrow{\Delta} BeF_2$ (D) $BeO + C + F_2 \xrightarrow{\Delta} BeF_2$

67. Given below are two statements, one is labelled as Assertion A and the other is labelled as **Reason R**.
Assertion A : Isotopes of hydrogen have almost same chemical properties, but difference in their rates of reaction.

Reason R : Isotopes of hydrogen have different enthalpy of bond dissociation.

In the light of the above statements, choose the most appropriate 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 and R is the correct explanation of A

(C) A is not correct but R is correct

(D) A is correct but R is not correct

68. Given below are two statements:

Statement I : Tropolone is an aromatic compound and has 871 electrons.

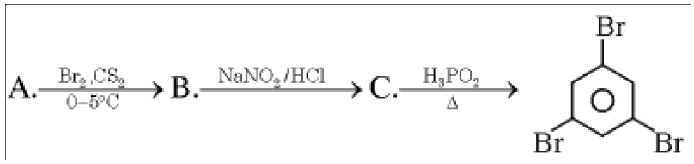
Statement II : π electrons of >C = O group in tropolone is involved in aromaticity.

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

(A) Both Statement I and Statement II are tme (B) Statement I is tme but Statement II is false

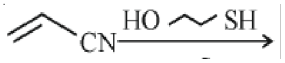
(C) Statement I is false but Statement II is tme (D) Both Statement I and Statement II are false

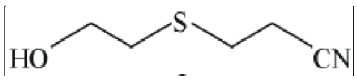
69. Compound A from the following reaction sequence is :

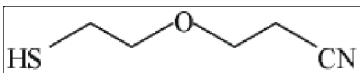


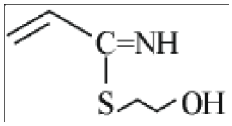
(A) Benzoic acid (B) Phenol (C) Salicyclicx acid (D) Aniline

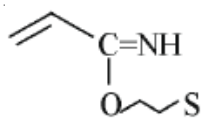
70. The major product for the following reaction is :



(A) 

(B) 

(C) 

(D) 

71. Which of the following are the Green house gases ?

1. Water vapour 2. Ozone

3. I_2 4. Molecular hydrogen

Choose the most appropriate answer from the options given

(A) 2 and 3 only (B) 3 and 4 only (C) 1 and 4 only (D) 1 and 2 only

72. Match List I with List II

	List - I		**List - II**
A.	Weak intermolecular forces of attraction	I.	Hexamethylenedia mine + adipic acid
B.	Hydrogen bonding	II.	$AlEt_3 + TiCl_4$
C.	Heavily branched polymer	III.	2–chloro–1, 3–butadiene
D.	High density polymer	IV.	Phenol + formaldehyde

Choose the correct answer from the options given below :

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

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

73. Given below are two statements :

Statement I : SO_2 and H_2O both possess V-shaped structure.

Statement II : The bond angle of SO_2 is less than that of H_2O.

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

(A) Both Statement I and Statement II are correct

(B) Statement I is correct but Statement II is incorrect

(C) Both Statement I and Statement II are incorrect

(D) Statement I is incorrect but Statement II is correct

74. he correct group of halide ions which can be oxidised by oxygen in acidic medium is

(A) Br^- only (B) Cl , Br and I^- only

(C) Br^- and I^- only (D) F only

75. What happens when methane undergoes combustion in systems A and B respectively ?

Adiabatic system	Diathermic container
System A	System B

(A)

System A	System B
Temperature rises	Temperature remains same

(B)

System A	System B
Temperature falls	Temperature rises

(C)

System A	System B
Temperature falls	Temperature remains same

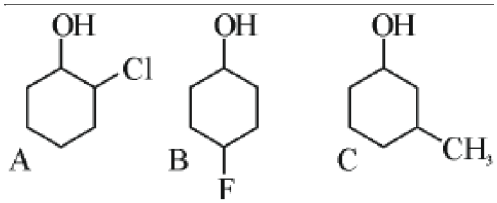
(D)

System A	System B
Temperature remains same	Temperature rises

76. Given below are two statements, one is labelled as

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

Assertion A : Order of acidic nature of the following compounds is A > B > C



Reason R : Fluoro is a stronger electron withdrawing group than Chloro group.

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

(A) A is false but R is tme

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

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

(D) A is tme but R is false

77. Identify the correct order of standard enthalpy of fomiation of sodium halides.

(A) NaI < NaBr < NaCl < NaF (B) NaF < NaCl < NaBr < NaI

(C) NaCl < NaF < NaBr < NaI (D) NaI < NaBr < NaF < NaCl

78. Match List I with List II

1 - Bromopropane is reacted with reagents in List I to give product in List II

	LIST I - Reagent		**LIST II - Product**
A.	KOH (alc)	I.	Nitrile
B.	KCN (alc)	II.	Ester
C.	$AgNO_2$	III.	Alkene
D.	$H_3CCOOAg$	IV.	Nitroalkane

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

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

79. The covalency and oxidation state respectively of boron in $[BF_4]^-$, are

(A) 4 and 3 (B) 4 and 4 (C) 3 and 4 (D) 3 and 5

80. Which of the following complexes will exhibit maximum attraction to an applied magnetic field ?

(A) $[Zn(H_2O)_6]^{2+}$ (B) $[CO(H_2O)_6]^{2+}$ (C) $[Co(en)_3]^{3+}$ (D) $[Ni(H_2O_6]^{2+}$

SECTION - B

81. 0.400 g of an organic compound (X) gave 0.376 g of AgBr in Carius method for estimation of bromine. % of bromine in the compound (X) is _____

(Given: Molar mass AgBr = 188 g mol-1 Br = 80 g mol^{-1})

82. 1 g of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01 mol of CO_2. The molar mass of M_2CO_3 is _____ g mol^{-1}. (Nearest integer)

83. See the following chemical reaction:

$$Cr_2O_7^{2-} + XH^+ + 6Fe^{2+} \rightarrow YCr^{3+} + 6Fe^{3+} + ZH_2O$$

The sum of X, Y and Z is _____.

84. If the formula of Borax is $Na_2B_4O_x(OH)_y \cdot zH_2O$, then x + y + z = _____

85. At 298 K, the standard reduction potential for Cu^{2+} / Cu electrode is 0.34 V.

Given : K_{sp} $Cu(OH)_2 = 1 \times 10^{-20}$

Take $\frac{2.303RT}{F} = 0.059V$

The reduction potential at pH =14 for the above couple is $(-)x \times 10^{-2}$ V. The value of x is _____

86. 20 niL of 0.1 M NaOH is added to 50 niL of 0.1 M acetic acid solution. The pH of the resulting solution is _____ $\times 10^{-2}$ (Nearest integer) **Given :** pKa (CH_3 COOH) = 4.76

log 2 = 0.30 log 3 = 0.48

87. $A(g) \rightarrow 2B(g) + C(g)$ is a first order reaction. The initial pressure of the system was found to be 800 mm Hg which increased to 1600 mm Hg after 10 min. The total pressure of the system after 30 min will be _____ mm Hg. (Nearest integer)

88. The orbital angular momentum of an electron in 3s orbital is $\frac{xh}{2\pi}$. The value of x is

89. Sodium metal crystallizes in a body centred cubic lattice with unit cell edge length of 4 Å. The radius of sodium atom is _____ $\times 10$ Å (Nearest integer)

90. Sea water contains 29.25% NaCl and 19% $MgCl_2$ by weight of solution. The nomial boiling point of the sea water is _____ ºC (Nearest integer)

Assume 100% ionization for both NaCl and $MgCl_2$ Given : $Kb(H_2O) = 0.52$ K kg mol^{-1}

Molar mass of NaCl and $MgCl_2$ is 58.5 and 95 g mol^{-1} respectively.

❐ ❐ ❐

13-April-2023 (Evening Batch) : JEE Main Paper

ANSWER KEY

Mathematics

Single Choice Correct

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

Numerical Value

21.	269	22.	7	23.	10	24.	16	25.	825
26.	2	27.	6	28.	12	29.	41	30.	12

Physics

Single Choice Correct

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

Numerical Value

51.	5	52.	4125	53.	5440	54.	75	55.	60
56.	500	57.	15	58.	3	59.	40	60.	2

Chemistry

Single Choice Correct

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

Numerical Value

81.	40	82.	100	83.	23	84.	17	85.	25
86.	458	87.	2200	88.	0	89.	17	90.	116