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

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

1. The number of five digit numbers, greater than 40000 and divisible by 5, which can be formed using the digits 0, 1, 3, 5, 7 and 9 without repetition, is equal to

(A) 120 (B) 132 (C) 72 (D) 96

2. Let α, β be the roots of the quadratic equation $x^2+\sqrt{6}x+3=0$. Then $\frac{\alpha^{23}+\beta^{23}+\alpha^{14}+\beta^{14}}{\alpha^{15}+\beta^{15}+\alpha^{10}+\beta^{10}}$ is equal to :

(A) 729 (B) 72 (C) 81 (D) 9

3. Let $< a_n >$ be a sequence such that $a_1+a_2+....+a_n=\frac{n^2+3n}{(n+1)(n+2)}$. If $28\sum_{k=1}^{10}\frac{1}{a_k}=p_1p_2p_3.....p_m$, where $p_1, p_2, ...p_m$ are the first m prime numbers, then m is equal to

(A) 7 (B) 6 (C) 5 (D) 8

4. Let the lines $l_1:\frac{x+5}{3}=\frac{y+4}{1}=\frac{z-\alpha}{-2}$ and $l_2: 3x+2y+z-2=0=x-3y+2z-13$ be coplanar. If the point P(a, b, c) on l_1 is nearest to the point Q(–4, –3, 2), then |a| + |b| + |c| is equal to

(A) 12 (B) 14
(C) 10 (D) 8

5. Let $P\left(\frac{2\sqrt{3}}{\sqrt{7}}, \frac{6}{\sqrt{7}}\right)$, Q, R and S be four points on the ellipse $9x^2 + 4y^2 = 36$. Let PQ and RS be mutually perpendicular and pass through the origin. If $\frac{1}{(PQ)^2}+\frac{1}{(RS)^2}=\frac{p}{q}$, where p and q are coprime, then p + q is equal to

(A) 143 (B) 137 (C) 157 (D) 147

6. Let a, b, c be three distinct real numbers, none equal to one. If the vectors $a\hat{i}+\hat{j}+\hat{k}$, $\hat{i}+b\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+c\hat{k}$ are coplanar, then $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}$ is equal to :

(A) 1 (B) –1 (C) –2 (D) 2

7. If the local maximum value of the function $f(x)=\left(\frac{\sqrt{3e}}{2\sin x}\right)^{\sin^2 x}$, $x\in\left(0, \frac{\pi}{2}\right)$, is $\frac{k}{e}$, then $\left(\frac{k}{e}\right)^8+\frac{k^8}{e^5}+k^8$ is equal to

(A) $e^5 + e^6 + e^{11}$ (B) $e^3 + e^5 + e^{11}$
(C) $e^3 + e^6 + e^{11}$ (D) $e^3 + e^6 + e^{10}$

8. Let D be the domain of the function $f(x)=\sin^{-1}\left(\log_{3x}\left(\frac{6+2\log_3 x}{-5x}\right)\right)$. If the range of the function g : D $\to$ R defined by g(x) = x – [x], ([x] is the greatest integer function), is [α, β), then $[\alpha^2]+\frac{5}{\beta}$ is equal to

(A) 46 (B) 135 (C) 136 (D) 45

9. Let y = y(x), y > 0, be a solution curve of the differential equation $(1 + x^2)\,dy = y\,(x - y)\,dx$. If y(0) = 1 and $y(2\sqrt{2})=\beta$, then

(A) $e^{3\beta^{-1}}=e(3+2\sqrt{2})$ (B) $e^{\beta^{-1}}=e^{-2}(5+\sqrt{2})$

(C) $e^{\beta^{-1}}=e^{-2}(3+2\sqrt{2})$ (D) $e^{3\beta^{-1}}=e(5+\sqrt{2})$

10. Among the two statements

$(S1):(p\to q)\wedge(q\wedge(\sim q))$ is a contradiction and

$(S2):(p\wedge q)\vee((\sim p)\wedge q)\vee(p\wedge(\sim q))\vee((\sim p)\wedge(\sim q))$ is a tautology

(A) only (S2) is true (B) only (S1) is true

(C) both are false (D) both are true

11. Let $\lambda\in Z$, $\vec{a}=\lambda\hat{i}+\hat{j}-\hat{k}$ and $\vec{b}=3\hat{i}-\hat{j}+2\hat{k}$. Let $\vec{c}$ be a vector such that $(\vec{a}+\vec{b}+\vec{c})\times\vec{c}=\vec{0}$, $\vec{a}\cdot\vec{c}=-17$ and $\vec{b}\cdot\vec{c}=-20$. Then $\left|\vec{c}\times(\lambda\hat{i}+\hat{j}+\hat{k})\right|^2$ is equal to :

(A) 62 (B) 46 (C) 53 (D) 49

12. The sum of the coefficients of the first 50 terms in the binomial expansion of $(1 - x)^{100}$ is equal to

(A) $-{}^{101}C_{50}$ (B) ${}^{99}C_{49}$ (C) $-{}^{99}C_{49}$ (D) ${}^{101}C_{50}$

13. The area of the region enclosed by the curve $y = x^3$ and its tangent at the point (–1, –1) is

(A) $\frac{27}{4}$ (B) $\frac{19}{4}$ (C) $\frac{23}{4}$ (D) $\frac{31}{4}$

14. Let $A=\begin{bmatrix}1 & \frac{1}{51}\\ 0 & 1\end{bmatrix}$. If $B=\begin{bmatrix}1 & 2\\ -1 & -1\end{bmatrix}A\begin{bmatrix}-1 & -2\\ 1 & 1\end{bmatrix}$, then the sum of all the elements of the matrix $\sum_{n=1}^{50}B^n$ is equal to :

(A) 100 (B) 50 (C) 75 (D) 125

15. Let the plane P : 4x – y + z = 10 be rotated by an angle $\frac{\pi}{2}$ about its line of intersection with the plane x + y – z = 4. If α is the distance of the point (2, 3, –4) from the new position of the plane P, then 35α is

(A) 90 (B) 85 (C) 105 (D) 126

16. If $\frac{1}{n+1}\,{}^nC_n+\frac{1}{n}\,{}^nC_{n-1}+....+\frac{1}{2}\,{}^nC_1+{}^nC_0=\frac{1023}{10}$ then n is equal to

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

17. Let C be the circle in the complex plane with centre $z_0 = \frac{1}{2}(1+3i)$ and radius r = 1. Let $z_1 = 1 + i$ and the complex number z_2 be outside the circle C such that $|z_1 - z_0|\,|z_2 - z_0| = 1$. If z_0, z_1 and z_2 are collinear, then the smaller value of $|z_2|^2$ is equal to

(A) $\frac{13}{2}$ (B) $\frac{5}{2}$ (C) $\frac{3}{2}$ (D) $\frac{7}{2}$

18. If the point $\left(\alpha, \frac{7\sqrt{3}}{3}\right)$ lies on the curve traced by the mid-points of the line segments of the lines $x\cos\theta + y\sin\theta = 7,\ \theta \in \left(0, \frac{\pi}{2}\right)$ between the co-ordinates axes, then α is equal to

(A) 7 (B) –7 (C) $-7\sqrt{3}$ (D) $7\sqrt{3}$

19. Two dice A and B are rolled. Let the numbers obtained on A and B be α and β respectively. If the variance of $\alpha - \beta$ is $\frac{p}{q}$, where p and q are co-prime, then the sum of the positive divisors of p is equal to

(A) 36 (B) 48 (C) 31 (D) 72

20. In a triangle ABC, if cos A + 2 cos B + cos C = 2 and the lengths of the sides opposite to the angles A and C are 3 and 7 respectively, then cos A - cos C is equal to

(A) $\frac{3}{7}$ (B) $\frac{9}{7}$ (C) $\frac{10}{7}$ (D) $\frac{5}{7}$

SECTION - B

21. A fair n (n > 1) faces die is rolled repeatedly until a number less than n appears. If the mean of the number of tosses required is $\frac{n}{9}$, then n is equal to _____.

22. Let the digits a, b, c be in A.P. Nine-digit numbers are to be formed using each of these three digits thrice such that three consecutive digits are in A.P. at least once. How many such numbers can be formed ?

23. Let [x] be the greatest integer $\le x$. Then the number of points in the interval (–2, 1), where the function $f(x) = |[x]| + \sqrt{x - [x]}$ is discontinuous is _____.

24. Let the plane x + 3y – 2z + 6 = 0 meet the co-ordinate axes at the points A, B, C. If the orthocentre of the triangle ABC is $\left(\alpha, \beta, \frac{6}{7}\right)$, then $98(\alpha + \beta)^2$ is equal to_____.

25. Let $I(x) = \int \sqrt{\frac{x+7}{x}}dx$ and I (9) = 12 + 7 $\log_e$ 7. If $I(1) = \alpha + 7\log_e(1+2\sqrt{2})$, then α^4 is equal to _____.

26. Let $D_k = \begin{vmatrix} 1 & 2k & 2k-1 \\ n & n^2+n+2 & n^2 \\ n & n^2+n & n^2+n+2 \end{vmatrix}$. If $\sum_{k=1}^{n} D_k = 96$, then n is equal to

27. Let the positive numbers a_1, a_2, a_3, a_4 and a_5 be in a G.P. Let their mean and variance be $\frac{31}{10}$ and $\frac{m}{n}$ respectively, where m and n are co-prime. If the mean of their reciprocals is $\frac{31}{40}$ and $a_3 + a_4 + a_5 = 14$, then m + n is equal to _____.

28. The number of relations, on the set {1, 2, 3} containing (1, 2) and (2, 3), which are reflexive and transitive but not symmetric, is_____

29. If $\int_{-0.15}^{0.15} \left|100x^2 - 1\right| dx = \frac{k}{3000}$, then k is equal to ____.

30. Two circles in the first quadrant of radii r_1 and r_2 touch the coordinate axes. Each of them cuts off an intercept of 2 units with the line x + y = 2. Then $r_1^2 + r_2^2 - r_1 r_2$ is equal to ____.

PHYSICS Section - A (Single Correct Answer)

31. An ice cube has a bubble inside. When viewed from one side the apparent distance of the bubble is 12 cm. when viewed from the opposite side, the apparent distance of the bubble is observed as 4 cm. If the side of the ice cube is 24 cm, the refractive index of the ice cube is

(A) 4/3 (B) 3/2 (C) 2/3 (D) 6/5

32. Two satellites A and B move round the earth in the same orbit. The mass of A is twice the mass of B. The quantity which is same for the two satellites will be :

(A) Potential energy (B) Total energy (C) Kinetic energy (D) Speed

33. The amplitude of 15 sin (1000 πt) is modulated by 10 sin (4πt) signal. The amplitude modulated signal contains frequencies of

1. 500 Hz. 2. 2 Hz 3. 250 Hz 4. 498 Hz
5. 502 Hz

Choose the correct answer from the options given below:

(A) (1) and (3) only (B) (1) and (4) only
(C) (1) and (2) only (D) (1), (4) and (5) only

34. In an n-p-n common emitter (CE) transistor the collector current changes from 5 mA to 16 mA for the change in base current from 100 µA and 200 µA, respectively. The current gain of transistor is_____.

(A) 110 (B) 0.9 (C) 210 (D) 9

35. If the r.m.s. speed of chlorine molecule is 490 m/s at 27° C, the r.m.s. speed of argon molecules at the same temperature will be (Atomic mass of argon = 39.9u, molecular mass of chlorine = 70.9u)

(A) 751.7 m/s (B) 451.7 m/s (C) 651.7 m/s (D) 551.7 m/s

36. A proton and an α-particle are accelerated from rest by 2V and 4V potentials, respectively. The ratio of their de-Broglie wavelength is:

(A) 4 : 1 (B) 2 : 1 (C) 8 : 1 (D) 16 : 1

37. Given below are two statements:

Statement I : The diamagnetic property depends on temperature.

Statement II : The included magnetic dipole moment in a diamagnetic sample is always opposite to the magnetizing field.

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

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

(B) Both Statement I and Statement II are true.

(C) Both Statement I and Statement II are false.

(D) Statement I is correct but Statement II is false.

38. A wire of resistance 160 Ω is melted and drawn in wire of one-fourth of its length. The new resistance of the wire will be

(A) 10 Ω (B) 640 Ω (C) 40 Ω (D) 16 Ω

39. Match List I with List II

	List I		**List II**
A.	Spring constant	I.	(T^{-1})
B.	Angular speed	II.	(MT^{-2})
C.	Angular momentum	III.	(ML^2)
D.	Moment of Inertia	IV.	(ML^2T^{-1})

Choose the correct answer from the options given below:

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

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

40. Three force F_1 = 10N, F_2 = 8 N, F_3 = 6 N are acting on a particle of mass 5 kg. The forces F_2 and F_3 are applied perpendicular so that particle remains at rest. If the force F_1 is removed, then the acceleration of the particle is:

(A) 2 ms^{-2} (B) 0.5 ms^{-2} (C) 4.8 ms^{-2} (D) 7 ms^{-2}

41. A body cools from 80°C to 60°C in 5 minutes. The temperature of the surrounding is 20°C. The time it takes to cool from 60°C to 40°C is:

(A) 500 s (B) $\frac{25}{3}$s (C) 450 s (D) 420 s

42. An engine operating between the boiling and freezing points of water will have

1. efficiency more than 27%
2. efficiency less than the efficiency a Carnot engine operating between the same two temperatures.
3. efficiency equal to 27%
4. efficiency less than 27%

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

43. Given below are two statements:

Statement I : A truck and a car moving with same kinetic energy are brought to rest by applying brakes which provide equal retarding forces. Both come to rest in equal distance.

Statement II : A car moving towards east takes a turn and moves towards north, the speed remains unchanged. The acceleration of the car is zero.

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

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

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

(C) Both Statement I is correct but Statement II are incorrect

(D) Both Statement I is correct but Statement II are correct

44. A particle is executing Simple Harmonic Motion (SHM). The ratio of potential energy and kinetic energy of the particle when its displacement is half of its amplitude will be:

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

45. A ball is thrown vertically upward with an initial velocity of 150 m/s. The ratio of velocity after 3 s and 5s is $\frac{x+1}{x}$. The value of x is _____. Take ($g = 10\ m/s^2$).

(A) 6 (B) 5 (C) – 5 (D) 10

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

Assertion A : If an electric dipole of dipole moment 30×10^{-5} Cm is enclosed by a closed surface, the net flux coming out of the surface will be zero.

Reason R : Electric dipole consists of two equal and opposite charges.

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

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

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

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

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

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

Assertion A : EM waves used for optical communication have longer wavelengths than that of microwave, employed in Radar technology.

Reason R : Infrared EM waves are more energetic than microwaves, (used in Radar)

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

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

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

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

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

48. A 12.5 eV electron beam is used to bombard gaseous hydrogen at room temperature. The number of spectral lines emitted will be:

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

49. The ratio of escape velocity of a planet to the escape velocity of earth will be:

Given : Mass of the planet is 16 times mass of earth and radius of the planet is 4 times the radius of earth.

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

50. Given below are two statements :

Statement I : When the frequency of an a.c. source in a series LCR circuit increases, the current in the circuit first increases, attains a maximum value and then decreases.

Statement II : In a series LCR circuit, the value of power factor at resonance is one.

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

(A) Statement I is incorrect but Statement II is true.

(B) Both Statement I and Statement II are false.

(C) Statement I is correct but Statement II is false.

(D) Both Statement I and Statement II are true.

SECTION - B

51. For a certain organ pipe, the first three resonance frequencies are in the ratio of 1 : 3 : 5 respectively. If the frequency of fifth harmonic is 405 Hz and the speed of sound in air is 324 ms^{-1} the length of the organ pipe is _____m.

52. For a rolling spherical shell, the ratio of rotational kinetic energy and total kinetic energy is x/5. The value of x is_____.

53. A compass needle oscillates 20 times per minute at a place where the dip is 30° and 30 times per minute where the dip is 60°. The ratio of total magnetic field due to the earth at two place respectively is $\frac{4}{\sqrt{x}}$.

The value of x is

54. A conducting circular loop is placed in a uniform magnetic field of 0.4 T with its plane perpendicular to the field. Somehow, the radius of the loop starts expanding at a constant rate of 1 mm/s. The magnitude of induced emf in the loop at an instant when the radius of the loop is 2 cm will be _____ μV.

55. To maintain a speed of 80 km/h by a bus of mass 500 kg on a plane rough road for 4 km distance, the work done by the engine of the bus will be _____KJ. [The coefficient of friction between tyre of bus and road is 0.04].

56. A common example of alpha decay is $^{238}_{92}U \longrightarrow {}^{234}_{90}Th + {}_2He^4 + Q$

Given : $^{238}_{92}U = 238.05060u$, $^{234}_{90}Th = 234.04360u$, $^{4}_{2}He = 4.00260u$, and $1u = 931.5\frac{MeV}{c^2}$

The energy released (Q) during the alpha decay of $^{238}_{92}U$ is _____MeV

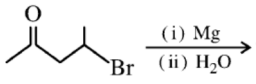
57. The current flowing through a conductor connected across a source is 2A and 1.2 A at 0°C and 100°C respectively. The current flowing through the conductor at 50°C will be _____ × 10^2 mA.

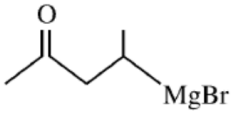
58. Two convex lenses of focal length 20 cm each are placed coaxially with a separation of 60 cm between them. The image of the distant object formed by the combination is at _____ cm from the first lens.

59. Glycerine of density 1.25 × 10^3 kg m^{-3} is flowing through the conical section of pipe. The area of cross-section of the pipe at its ends is 10 cm^2 and 5 cm^2 and pressure drop across its length is 3 Nm^{-2}. The rate of flow of glycerine through the pipe is x × 10^{-5} m^3 s^{-1}. The value of x is ____.

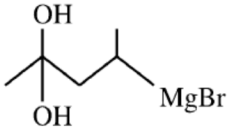
60. 64 identical drops each charged upto potential of 10 mV are combined to form a bigger dorp. The potential of the bigger drop will be _____ mV.

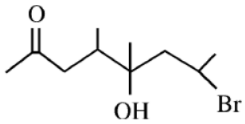
CHEMISTRY Section - A (Single Correct Answer)

61.  (Major Product) A is

(A) 

(B) 

(C) 

(D) 

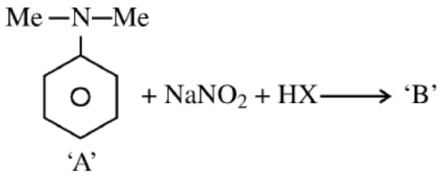
62. Four gases A, B, C and D have critical temperatures 5.3, 33.2, 126.0 and 154.3K respectively. For their adsorption on fixed amount of charcoal, the correct order is :

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

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

63. Given below are two statement: one is labelled as Assertion A and the other is labelled as **Reason R**
Assertion A: 5f electrons can participate in bonding to a far greater extent than 4f electrons
Reason R: 5f orbitals are not as buried as 4f orbitals
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

64. The incorrect statement regarding the reaction given below is



(A) The electrophile involved in the reaction is NO^+
(B) 'B' is N-nitroso ammonium compound
(C) The reaction occurs at low temperature
(D) The product 'B' formed in the above reaction is p-nitroso compound at low temperature

65. Match List I with List II

	LIST I Complex		**LIST II CFSE(Δ_0)**
A.	$[Cu(NH_3)6]^{2+}$	I.	–0.6
B.	$[Ti(N_2O)_6]^{3+}$	II.	–2.0
C.	$[Fe(CN)_6]^3$	III.	–1.2
D.	$[NIF_6]^4$	IV.	–0.4

Choose the correct answer from the options given below :
(A) A-I, B-IV, C-II, D-III (B) A-II, B-III, C-I, D-IV
(C) A-I, B-II, C-IV, D-III (D) A-III, B-IV, C-I, D-II

66. Match List I with List II

	LIST I (Examples)		**LIST I (Examples)**
A.	2-Chloro-l, 3 - butadiene	I.	Biodegradable polymer
B.	Nylon 2-nylon 6	II.	Synthetic Rubber
C.	Polyacrylonitrile	III.	Polyester
D.	Dacron	IV.	Addition Polymer

Choose the correct answer from the options given below :
(A) A-IV, B-I, C-III, D-II (B) A-IV, B-III, C-I, D-II
(C) A-II, B-IV, C-I, D-III (D) A-II, B-I, C-IV, D-III

67. The density of alkali metals is in the order
(A) Na < K < Cs < Rb (B) K < Na < Rb < Cs
(C) K < Cs < Na < Rb (D) Na < Rb < K < Cs

68. Given below are two statements :

Statements : $SbCl_5$ is more covalent than $SbCl_3$

Statements : The higher oxides of halogens also tend to be more stable than the lower ones.

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) Both statement I and Statement II are incorrect

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

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

69. A metal chloride contains 55.0% of chlorine by weight. 100 mL vapours of the metal chloride at STP weigh 0.57 g. The molecular formula of the metal chloride is

(Given : Atomic mass of chlorine is 35.5u)

(A) MCl_2 (B) MCl_4 (C) MCl_3 (D) MCl

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

Assertion A : In the Ellingham diagram, a sharp change in slope of the line is observed for $Mg \rightarrow MgO$ at 1120 °C

Reason R : There is a large change of entropy associated with the change of 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) 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

71. Match List I with List II

	LIST I		**LIST II**
A.	Nitrogen oxides in air	I.	Eutrophication
B.	Methane in air	II.	pH of rain water becomes 5.6.
C.	Carbon dioxide	III.	Global warming
D.	Phosphate fertilisers in water	IV.	Acid rain

Choose the correct answer from the options given below :

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

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

72. For lead storage battery pick the correct statements

A. During charging of battery, $PbSO_4$ on anode is converted into PbO_2

B. During charging of battery, $PbSO_4$ on cathode is converted into PbO_2

C. Lead storage battery, consists of grid of lead packed with PbO_2 as anode

D. Lead storage battery has ~ 38% solution of sulphuric acid as an electrolyte

Choose the correct answer from the options given below :

(A) B, D only (B) B, C, D only (C) A, B, D only (D) B, C only

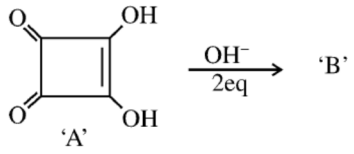
73. $2-\text{hexene} \xrightarrow[(ii)\ H_2O]{(i)\ O_3} \text{Product}$

The two products formed in above reaction are -

(A) Butanoic acid and acetic acid (B) Butanal and acetic acid

(C) Butanal and acetaldehyde (D) Butanoic acid and acetaldehyde

74. Correct statements for the given reaction are :



A. Compound 'B' is aromatic

B. The completion of above reaction is very slow

C. 'A' shows tautomerism

D. The bond lengths C-C in compound B are found to be same

Choose the correct answer from the options given below :

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

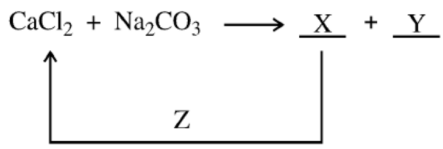
(C) B, C and D only (D) A, C and D only

75. The bond order and magnetic property of acetylide ion are same as that of

(A) NO^+ (B) O_2^+

(C) O_2^- (D) N_2^+

76. In the given reaction cycle



X, Y and Z resppectively are

(A)

X	Y	Z
CaO	$NaCl + CO_2$	KCl

(B)

X	Y	Z
$CaCO_3$	NaCl	KCl

(C)

X	Y	Z
$CaCO_3$	NaCl	KCl

(D)

X	Y	Z
CaO	$NaCl + CO_2$	NaCl

77. Given below are two statements :

Statement I : Boron is extremely hard indicating its high lattice energy

Statement II : Boron has highest melting and boiling point compared to its other group members.

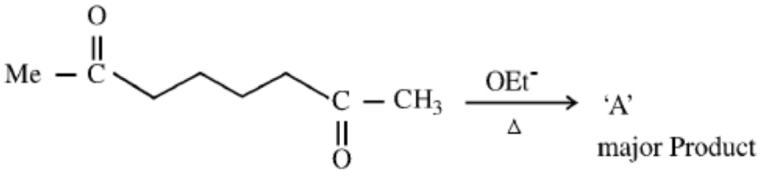
In the light of the above statements, choose the most appropriate answer from the options given below

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

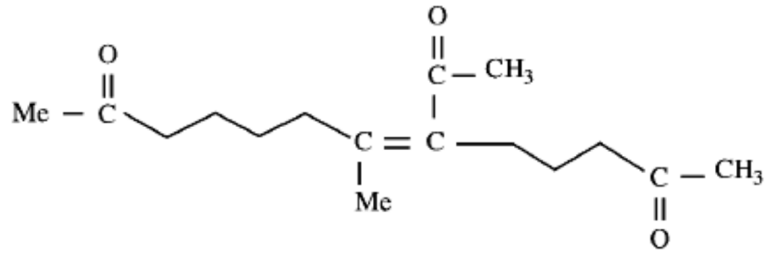
(B) Both Statement I and Statement II is correct

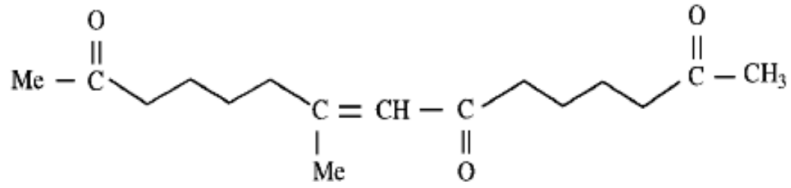
(C) Statement I is correct but Statement II is incorrect

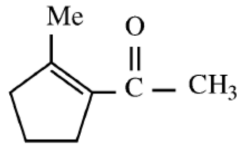
(D) Both Statement I and Statement II is incorrect

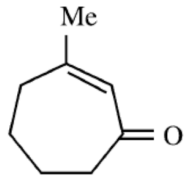
78. 

A in the above reaction is :

(A) 

(B) 

(C) 

(D) 

79. Match List I with List II

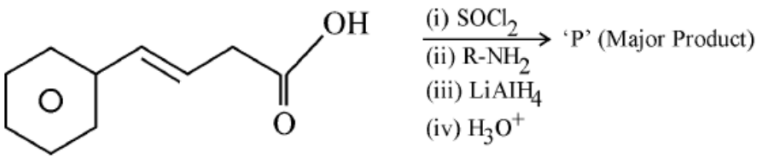
	LIST I Type of Hydride		LIST II Example
A.	Electron deficient hydride	I.	MgH_2
B.	Electron rich hydride	II.	HF
C.	Electron precise hydride	III.	B_2H_6
D.	Saline hydride	IV.	CH_4

Choose the correct answer from the options given below :

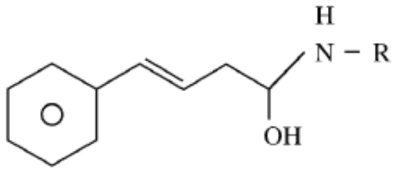
(A) A-III, B-II, C-IV, D-I (B) A-II, B-III, C-IV, D-I

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

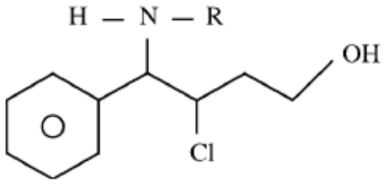
80. The major product 'P' formed in the following sequence of reactions is



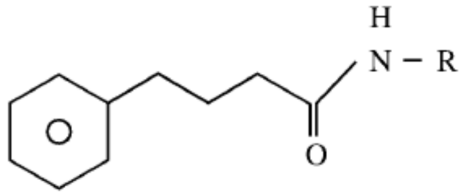
(A)



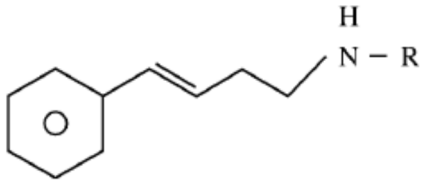
(B)



(C)



(D)



SECTION - B

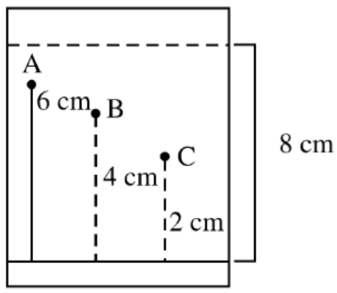
81. One mole of an ideal gas at 350K is in a 2.0 L vessel of thermally conducting walls, which are in contact with the surroundings. It undergoes isothermal reversible expansion from 2.0L to 3.0L against a constant pressure of 4 atm. The change in entropy of the surroundings (AS) is _____ J K^{-1} (Nearest integer)
Given :R = 8.314 J K^{-1} Mol^{-1}.

82. The mass of NH_3 produced when 131.8 kg of cyclohexanecarbaldehyde undergoes Tollen's test is —— kg. (Nearest Integer)
Molar Mass of C = 12g/mol
N = 14g/mol
O = 16g/mol

83. In an oligopeptide named Alanylglycylphenyl alanyl isoleucine, the number of sp^2 hybridised carbons is _____

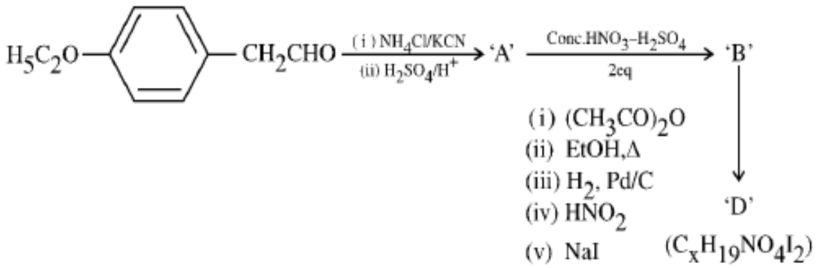
84. An analyst wants to convert. 1L HC1 of pH = 1 to a solution of HC1 of pH 2. The volume of water needed to do this dilution is _____ mL. (Nearest Integer)

85. Three organic compounds A, B and C were allowed to run in thin layer chromatography using hexane and gave the following result (see figure). The Rf value of the most polar compound is _____ × 10^{-2}



86. 80 mole percent of $MgCl_2$ is dissociated in aqueous solution. The vapour pressure of 1.0 molal aqueous solution of $MgCl_2$ at 38°C is _____ mm Hg. (Nearest integer)

Given : Vapour pressure of water at 38°C is 50 mm Hg

87. 

The value of x in compound 'D' is

88. At 600K, the root mean square (rms) speed of gas X (molar mass = 40) is equal to the most probable speed of gas Y at 90K. The molar mass of the gas Y is _____ g mol^{-1}. (Nearest integer)

89. The reaction $2NO + Br_2 \rightarrow 2NOBr$ takes places through the mechanism given below :

$NO + Br_2 \Leftrightarrow NOBr_2$ (fast)

$NOBr_2 + NO \rightarrow 2NOBr$ (slow)

The overall order of the reaction is _____

90. Values of work function (W_0) for a few metals are given below

Metal	Li	Na	K	Mg	Cu	Ag
W_0 / eV	2.42	2.3	2.25	3.7	4.8	4.3

The number of metals which will show photoelectric effect when light of wavelength 400nm falls on it is _____

Given : $h = 6.6 \times 10^{-34}$ J s

$c = 3 \times 10^8$ m s^{-1}

$e = 1.6 \times 10^{-19}$ C

❐ ❐ ❐

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

ANSWER KEY

Mathematics

Single Choice Correct

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

Numerical Value

21.	10	22.	1260	23.	2	24.	288	25.	64
26.	6	27.	211	28.	3	29.	575	30.	7

Physics

Single Choice Correct

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

Numerical Value

51.	1	52.	2	53.	243	54.	50	55.	784
56.	4	57.	15	58.	100	59.	4	60.	160

Chemistry

Single Choice Correct

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

Numerical Value

81.	3	82.	60	83.	10	84.	9000	85.	25
86.	48	87.	15	88.	4	89.	3	90.	3