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

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

1. If $\begin{vmatrix} x+1 & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda^2 \end{vmatrix} = \frac{9}{8}(103x+81)$, then λ, $\frac{\lambda}{3}$ are the roots of the equation

(A) $4x^2 + 24x - 27 = 0$ (B) $4x^2 - 24x + 27 = 0$

(C) $4x^2 + 24x + 27 = 0$ (D) $4x^2 - 24x - 27 = 0$

2. Let the line passing through the points P (2, –1, 2) and Q (5, 3, 4) meet the plane x – y + z = 4 at the point R. Then the distance of the point R from the plane x + 2y + 3z + 2 = 0 measured parallel to the line $\frac{x-7}{2} = \frac{y+3}{2} = \frac{z-2}{1}$ is equal to :

(A) $\sqrt{31}$ (B) $\sqrt{189}$ (C) $\sqrt{61}$ (D) 3

3. If the 1011th term from the end in the binomial expansion of $\left(\frac{4x}{5} - \frac{5}{2x}\right)^{2022}$ is 1024 times 1011th term from the beginning, then 32|x| is equal to

(A) 12 (B) 8 (C) 10 (D) 15

4. Let the function f : [0, 2] $\to$ R be defined as $f(x) = \begin{cases} e^{\min\{x^2,\, x-[x]\},} & x \in [0,\, 1) \\ e^{[x-\log_e x]}, & x \in [1,\, 2] \end{cases}$ where [t] denotes the greatest integer less than or equal to t. Then the value of the integral $\int_0^2 xf(x)dx$ is

(A) 2e – 1 (B) $1+\frac{3e}{2}$ (C) $2e-\frac{1}{2}$ (D) $(e-1)\left(e^2+\frac{1}{2}\right)$

5. Let y = y (x) be the solution of the differential equation $\frac{dy}{dx} + \frac{5}{x(x^5+1)}y = \frac{(x^5+1)^2}{x^7}$, $x > 0$. If y(1) = 2, then y(2) is equal to :

(A) $\frac{637}{128}$ (B) $\frac{679}{128}$ (C) $\frac{693}{128}$ (D) $\frac{697}{128}$

6. If four distinct points with position vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ and $\vec{d}$ are coplanar; then $[\vec{a}\ \vec{b}\ \vec{c}]$ is equal to

(A) $[\vec{d}\ \vec{c}\ \vec{a}]+[\vec{b}\ \vec{d}\ \vec{a}]+[\vec{c}\ \vec{d}\ \vec{b}]$ (B) $[\vec{d}\ \vec{b}\ \vec{a}]+[\vec{a}\ \vec{c}\ \vec{d}]+[\vec{d}\ \vec{b}\ \vec{c}]$

(C) $[\vec{a}\ \vec{d}\ \vec{b}]+[\vec{d}\ \vec{c}\ \vec{a}]+[\vec{d}\ \vec{b}\ \vec{c}]$ (D) $[\vec{b}\ \vec{c}\ \vec{d}]+[\vec{d}\ \vec{a}\ \vec{c}]+[\vec{d}\ \vec{b}\ \vec{a}]$

7. If $f:\mathbb{R}\to\mathbb{R}$ be a continuous function satisfying $\int_0^{\pi/2} f(\sin 2x)\cdot\sin x\,dx+\alpha\int_0^{\pi/4} f(\cos 2x)\cdot\cos x\,dx=0$, then α is equal to :

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

8. If the system of linear equations

$7x + 11y + \alpha z = 13$

$5x + 4y + 7z = \beta$

$175x + 194y + 57z = 361$

has infinitely many solutions, then $\alpha + \beta + 2$ is equal to

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

9. The domain of the function $f(x)=\frac{1}{\sqrt{[x]^2-3[x]-10}}$ is (where [x] denotes the greatest integer less than or equal to x)

(A) $(-\infty, -2)\cup(5, \infty)$ (B) $(-\infty, -3]\cup[6, \infty)$

(C) $(-\infty, -2)\cup[6, \infty)$ (D) $(-\infty, -3]\cup(5, \infty)$

10. Let P be the plane passing through the points (5, 3, 0), (13, 3, –2) and (1, 6, 2). For $\alpha\in N$, if the distances of the points A (3, 4, α) and B (2, α, a) from the plane P are 2 and 3 respectively, then the positive value of 'a' is

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

11. The converse of the statement $((\sim p)\wedge q)\Rightarrow r$ is

(A) $(\sim r)\Rightarrow p\wedge q$ (B) $(\sim r)\Rightarrow((\sim p)\wedge q)$ (C) $((\sim p)\vee q)\Rightarrow r$ (D) $(p\vee(\sim q))\Rightarrow(\sim r)$

12. The angle of elevation of the top P of a tower from the feet of one person standing due south of the tower is 45º and from the feet of another person standing due west of the tower is 30º. If the height of the tower is 5 meters, then the distance (in meters) between the two persons is equal to

(A) 10 (B) 5 (C) $5\sqrt{5}$ (D) $\frac{5}{2}\sqrt{5}$

13. Let a, b, c and d be positive real numbers such that a + b + c + d = 11. If the maximum value of $a^5b^3c^2d$ is 3750β, then the value of β is

(A) 90 (B) 110 (C) 55 (D) 108

14. If the radius of the largest circle with centre (2, 0) inscribed in the ellipse $x^2 + 4y^2 = 36$ is r, then $12r^2$ is equal to

(A) 72 (B) 115 (C) 92 (D) 69

15. Let the mean of 6 observations 1, 2, 4, 5, x and y be 5 and their variance be 10. Then their mean deviation about the mean is equal to

(A) $\frac{10}{3}$ (B) $\frac{7}{3}$ (C) 3 (D) $\frac{8}{3}$

16. The sum of the coefficients of three consecutive terms in the binomial expansion of $(1 + x)^{n+2}$, which are in the ratio 1 : 3 : 5, is equal to

(A) 25 (B) 63 (C) 41 (D) 92

17. If the letters of the word MATHS are permuted and all possible words so formed are arranged as in a dictionary with serial numbers, then the serial number of the word THAMS is

(A) 103 (B) 104 (C) 101 (D) 102

18. For $a \in C$, let $A = \{z \in C : Re(a + \bar{z}) > Im(\bar{a} + z)\}$ and $B = \{z \in C : Re(a + \bar{z}) < Im(\bar{a} + z)\}$. Then among the two statements :

(S1) : If Re (A), Im (A) > 0, then the set A contains all the real numbers

(S2) : If Re (A), Im (A) < 0, then the set B contains all the real numbers,

(A) Only (S1) is true (B) both are false

(C) Only (S2) is true (D) Both are true

19. Let A = {1, 3, 4, 6, 9} and B = {2, 4, 5, 8, 10}. Let R be a relation defined on A × B such that R = {$((a_1, b_1), (a_2, b_2)) : a_1 \le b_2$ and $b_1 \le a_2$ }. Then the number of elements in the set R is

(A) 26 (B) 160 (C) 180 (D) 52

20. Let f and g be two functions defined by $f(x) = \begin{cases} x+1, & x<0 \\ |x-1|, & x \ge 0 \end{cases}$ and $g(x) = \begin{cases} x+1, & x<0 \\ 1, & x \ge 0 \end{cases}$. Then (gof) (x) is

(A) Differentiable everywhere

(B) Continuous everywhere but not differentiable exactly at one point

(C) Not continuous at x = –1

(D) Continuous everywhere but not differentiable at x = 1

SECTION - B

21. The number of points, where the curve $f(x) = e^{8x} - e^{6x} - 3e^{4x} - e^{2x} + 1$, $x \in \mathbb{R}$ cuts x-axis, is equal to

22. Let the probability of getting head for a biased coin be $\frac{1}{4}$. It is tossed repeatedly until a head appears. Let N be the number of tosses required. If the probability that the equation $64x^2 + 5Nx + 1 = 0$ has no real root is $\frac{p}{q}$, where p and q are co-prime, then q – p is equal to

23. Let $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} - \hat{k}$. If $\vec{c}$ is a vector such that $\vec{a} \cdot \vec{c} = 11$, $\vec{b} \cdot (\vec{a} \times \vec{c}) = 27$ and $\vec{b} \cdot \vec{c} = -\sqrt{3}|\vec{b}|$, then $|\vec{a} \times \vec{c}|^2$ is equal to

24. Let $S = \left\{ z \in C - \{i, 2i\} : \frac{z^2 + 8iz - 15}{z^2 - 3iz - 2} \in R \right\}$. If $\alpha - \frac{13}{11}i \in S$, $\alpha \in \mathbb{R} - \{0\}$, then $242\alpha^2$ equal to

25. For $k \in N$, if the sum of series $1 + \frac{4}{k} + \frac{8}{k^2} + \frac{13}{k^3} + \frac{19}{k^4} + ...$ is 10, then the value of k is

26. Let A = {1, 2, 3, 4, 5} and B = {1, 2, 3, 4, 5, 6}. Then the number of functions $f : A \to B$ satisfying f(1) + f(2) = f(4) – 1 is equal to

27. Let the tangent to the parabola $y^2 = 12x$ at the point $(3, \alpha)$ be perpendicular to the line 2x + 2y = 3. Then the square of distance of the point (6, –4) from the normal to the hyperbola $\alpha^2x^2 - 9y^2 = 9\alpha^2$ at its point $(\alpha - 1, \alpha + 2)$ is equal to

28. Let the line $\ell : x = \frac{1-y}{-2} = \frac{z-3}{\lambda}$, $\lambda \in \mathbb{R}$ meet the plane P : x + 2y + 3z = 4 at the point (α, β, γ). If the angle between the line ℓ and the plane P is $\cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then $\alpha + 2\beta + 6\gamma$ is equal to

29. If the line $\ell_1 : 3y - 2x = 3$ is the angular bisector of the lines $\ell_2 : x - y + 1 = 0$ and $\ell_3 : \alpha x + \beta y + 17 = 0$, then $\alpha^2 + \beta^2 - \alpha - \beta$ is equal to

30. If A is the area in the first quadrant enclosed by the curve C : $2x^2 - y + 1 = 0$, the tangent to C at the point (1, 3) and the line x + y = 1, then the value of 60A is

PHYSICS Section - A (Single Correct Answer)

31. Eight equal drops of water are falling through air with a steady speed of 10 cm/s. If the drops coalesce, the new velocity is:-

(A) 10 cm/s (B) 40 cm/s (C) 16 cm/s (D) 5 cm/s

32. A car P travelling at 20 ms^{-1} sounds its horn at a frequency of 400 Hz. Another car Q is travelling behind the first car in the same direction with a velocity 40 ms^{-1}. The frequency heard by the passenger of the car Q is approximately [Take, velocity of sound = 360 ms^{-1}]

(A) 514 Hz (B) 421 Hz (C) 485 Hz (D) 471 Hz

33. A plane electromagnetic wave of frequency 20 MHz propagates in free space along x-direction. At a particular space and time, $\vec{E} = 6.6\hat{j}$ V/m. What is $\vec{B}$ at this point ?

(A) $-2.2 \times 10^{-8}\ \hat{i}T$ (B) $2.2 \times 10^{-8}\ \hat{k}T$

(C) $-2.2 \times 10^{-8}\ \hat{k}T$ (D) $2.2 \times 10^{-8}\ \hat{i}T$

34. A capacitor of capacitance C is charged to a potential V. The flux of the electric field through a closed surface enclosing the positive plate of the capacitor is:

(A) $\frac{CV}{2\varepsilon_0}$ (B) $\frac{2CV}{\varepsilon_0}$ (C) $\frac{CV}{\varepsilon_0}$ (D) Zero

35. If force (F), velocity (V) and time (T) are considered as fundamental physical quantity, then dimensional formula of density will be:

(A) $FV^{-2}T^2$ (B) $FV^{-4}T^2$ (C) FV^4T^{-6} (D) $F^2V^{-2}T^6$

36. In satellite communication, the uplink frequency band used is:

(A) 3.7 – 4.2 GHz (B) 5.925 – 6.425 GHz

(C) 76 – 88 MHz (D) 420 – 890 MHz

37. If V is the gravitational potential due to sphere of uniform density on it's surface, then it's value at the center of sphere will be:-

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

38. A body of mass 500 g moves along x-axis such that it's velocity varies with displacement x according to the relation $v = 10\sqrt{x}$ m/s the force acting on the body is:-

(A) 166 N (B) 25 N

(C) 125 N (D) 5 N

39. A projectile is projected at 30° from horizontal with initial velocity 40 ms^{-1}. The velocity of the projectile at t = 2 s from the start will be: (Given g = 10 m/s^2)

(A) $20\sqrt{3}$ ms^{-1} (B) $40\sqrt{3}$ ms^{-1} (C) 20 ms^{-1} (D) Zero

40. When one light ray is reflected from a plane mirror with 30° angle of reflection, the angle of deviation of the ray after reflection is:

(A) 140° (B) 120° (C) 110° (D) 130°

41. A spaceship of mass 2×10^4 kg is launched into a circular orbit close to the earth surface. The additional velocity to be imparted to the spaceship in the orbit to overcome the gravitational pull will be (if g = 10 m/s^2 and radius of earth = 6400 km)

(A) $11.2\left(\sqrt{2}-1\right)$ km/s (B) $7.9\left(\sqrt{2}-1\right)$ km/s

(C) $8\left(\sqrt{2}-1\right)$ km/s (D) $7.4\left(\sqrt{2}-1\right)$ km/s

42. The ratio of the de-Broglie wavelengths of proton and electron having same kinetic energy:
(Assume $m_p = m_e \times 1849$)

(A) 1 : 43 (B) 1 : 30 (C) 1 : 62 (D) 2 : 43

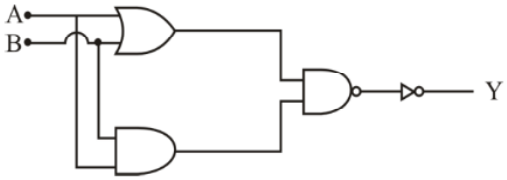
43. The thermodynamic process, in which internal energy of the system remains constant is

(A) Isochoric (B) Isothermal (C) Adiabatic (D) Isobaric

44. The energy of He^+ ion in its first excited state is. (The ground state energy for the Hydrogen atom is – 13.6 eV):

(A) – 3.4 eV (B) – 54.4 eV (C) – 13.6 eV (D) – 27.2 eV

45. The logic operations performed by the given digital circuit is equivalent to:

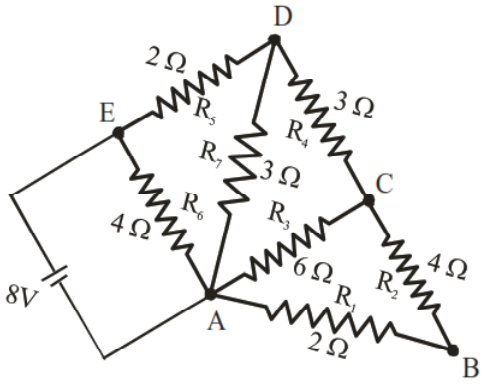


(A) AND (B) NOR (C) OR (D) NAND

46. The root mean square speed of molecules of nitrogen gas at 27°C is approximately: (Given mass of a nitrogen molecule = 4.6×10^{-26} kg and take Boltzmann constant $k_B = 1.4 \times 10^{-23}$ JK^{-1})

(A) 523 m/s (B) 1260 m/s (C) 91 m/s (D) 27.4 m/s

47.



The current flowing through R_2 is:

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

48. When vector $\vec{A} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ is subtracted from vector $\vec{B}$, it gives a vector equal to $2\hat{j}$. Then the magnitude of vector $\vec{B}$ will be:

(A) $\sqrt{13}$ (B) 3 (C) $\sqrt{6}$ (D) $\sqrt{5}$

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

Assertion A: A bar magnet dropped through a metallic cylindrical pipe takes more time to come down compared to a non-magnetic bar with same geometry and mass.

Reason R: For the magnetic bar, Eddy currents are produced in the metallic pipe which oppose the motion of the magnetic bar.

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

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

50. An electron is allowed to move with constant velocity along the axis of current carrying straight solenoid.

A. The electron will experience magnetic force along the axis of the solenoid.

B. The electron will not experience magnetic force.

C. The electron will continue to move along the axis of the solenoid.

D. The electron will be accelerated along the axis of the solenoid.

E. The electron will follow parabolic path-inside the solenoid.

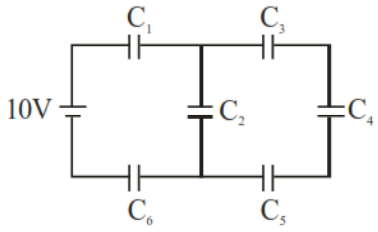
Choose the correct answer from the options given below:

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

SECTION - B

51. In the given circuit,

C_1 = 2 µF, C_2 = 0.2 µF, C_3 = 2 µF, C_4 = 4 µF, C_5 = 2µF, C_6 = 2µF, the charge stored on capacitor C_4 is _____ µC.



52. A circular plate is rotating in horizontal plane, about an axis passing through its center and perpendicular to the plate, with an angular velocity ω. A person sits at the center having two dumbbells in his hands. When he stretches out his hands, the moment of inertia of the system becomes triple. If E be the initial Kinetic energy of the system, then final Kinetic energy will be E/x. The value of x is

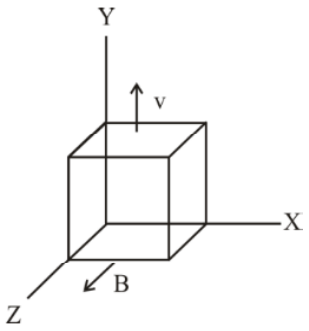
53. A nucleus disintegrates into two nuclear parts, in such a way that ratio of their nuclear sizes is $1 : 2^{1/3}$. Their respective speed have a ratio of n : 1. The value of n is _____

54. Two identical cells each of emf 1.5 V are connected in series across a 10 Ω resistance. An ideal voltmeter connected across 10 Ω resistance reads 1.5 V. The internal resistance of each cell is ____Ω.

55. A block of mass 5 kg starting from rest pulled up on a smooth incline plane making an angle of 30° with horizontal with an affective acceleration of 1 ms^{-2}. The power delivered by the pulling force at t = 10 s from the start is _____ W. [Use g = 10 ms^{-2}] (calculate the nearest integer value)

56. A coil has an inductance of 2H and resistance of 4Ω. A 10 V is applied across the coil. The energy stored in the magnetic field after the current has built up to its equilibrium value will be ____$\times 10^{-2}$ J

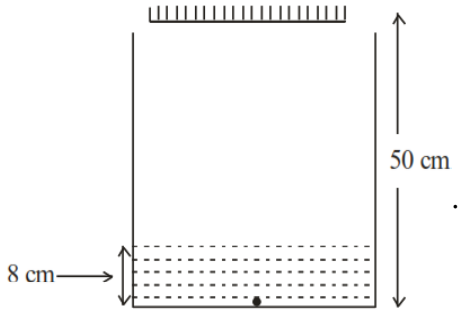
57. A metallic cube of side 15 cm moving along y-axis at a uniform velocity of 2 ms^{-1}. In a region of uniform magnetic field of magnitude 0.5 T directed along z-axis. In equilibrium the potential difference between the faces of higher and lower potential developed because of the motion through the field will be _____ mV.



58. A wire of density 8×10^3 kg/m^3 is stretched between two clamps 0.5 m apart. The extension developed in the wire is 3.2×10^{-4} m. If Y = 8×10^{10} N/m^2, the fundamental frequency of vibration in the wire will be _____ Hz.

59. The surface tension of soap solution is 3.5×10^{-2} Nm^{-1}. The amount of work done required to increase the radius of soap bubble from 10 cm to 20 cm is _____$\times 10^{-4}$ J.

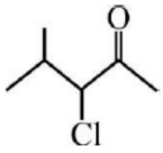
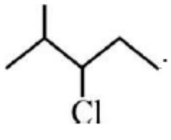
60. As shown in the figure, a plane mirror is fixed at a height of 50 cm from the bottom of tank containing water $\left(\mu = \frac{4}{3}\right)$. The height of water in the tank is 8 cm. A small bulb is placed at the bottom of the water tank. The distance of image of the bulb formed by mirror from the bottom of the tank is _____ cm.

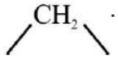


CHEMISTRY Section - A (Single Correct Answer)

61. Which hydride among the following is less stable?
(A) BeH_2 (B) NH_3 (C) HF (D) LiH

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

Assertion A :  can be subjected to Wolff-Kishner reduction to give  .

Reason A : Wolff-Kishner reduction is used to convert  into  .

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

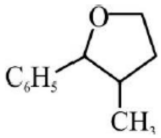
63. The major product formed in the following reaction is :

$$C_6H_5-CH(OH)-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CHO \xrightarrow[\Delta]{Zn(Hg)HCl} \text{Major Products}$$

(1) $C_6H_5-CH(OH)-\underset{\displaystyle CH_3}{\underset{|}{CH}}-C_2H_5$

(2) $C_6H_5-CH=\underset{\displaystyle CH_3}{\underset{|}{C}}-C_2H_5$

(3) $C_6H_5-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH-C_2H_5$

(4) 

Choose the correct answer from the options given below :

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

64. Which of the following compounds is an example of Freon ?

(A) $C_2Cl_2F_2$ (B) C_2HF_3 (C) $C_2H_2F_2$ (D) C_2F_4

65. For a chemical reaction A + B $\rightarrow$ Product, the order is 1 with respect to A and B.

Rate mol $L^{-1}s^{-1}$	[A] mol L^{-1}	[B] mol L^{-1}
0.10	20	0.5
0.40	x	0.5
0.80	40	y

What is the value of x and y ?

(A) 80 and 2 (B) 40 and 4

(C) 160 and 4 (D) 80 and 4

66. Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.
Assertion A : $[CoCl(NH_3)_5]^{2+}$ absorbs at lower wavelength of light with respect to $[Co(NH_3)_5(H_2O)]^{3+}$
Reason R : It is because the wavelength of the light absorbed depends on the oxidation state of the metal ion.

In the light of the above 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 are true and R is the correct explanation of A.

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

67. Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.
Assertion A : A solution of the product obtained by heating a mole of glycine with a mole of chlorine in presence of red phosphorous generates chiral carbon atom.
Reason R : A molecule with 2 chiral carbons is always optically active.
In the light of the above 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 are true and R is the correct explanation of A.
(D) Both A and R are true and R is NOT the correct explanation of A.

68. $H_3C-CH_2-CH(CH_3)-CH_3 \xrightarrow[\text{(iii) } D_2O]{\text{(i) NaI, } H_3PO_3 \text{ (ii) Mg, Dry ether}} [X]$ Product

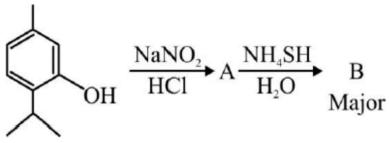
Product [X] formed in the above reaction is :

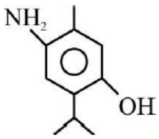
(A) $H_3C-CH_2-CH(D)-CH_3$ (B) $H_3C-CH_2-C(H)(OH)-CH_3$

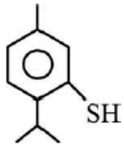
(C) $H_3C-CH_2-CH=CH_2$ (D) $H_3C-CH=CH-CH_3$

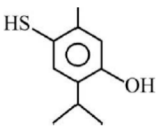
69. Given below are two statements :
Statements I : Ethene at 333 to 343K and 6-7 atm pressure in the presence of $AlEt_3$ and $TiCl_4$ undergoes addition polymerization to give LDP.
Statement II : Caprolactam at 533-543K in H_2O through step growth polymerizes to give Nylon 6. In the light of the above Statements, chose the correct answer from the options given below :
(A) Both Statement I and Statements II are true
(B) Statement I is false but Statement II is true
(C) Statement I is true but Statement II is false
(D) Both Statement I and Statement II are false

70. Compound 'B' is



(A)  (B) 

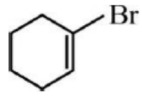
(C) 

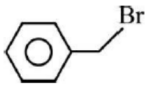
(D) 

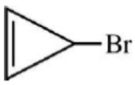
71. Which one of the following pairs is an example of polar molecular solids ?
(A) $SO_2(s)$, $NH_3(s)$ (B) $SO_2(s)$, $CO_2(s)$ (C) HCl(s), AlN(s) (D) MgO(s), $SO_2(s)$

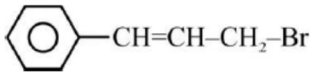
72. One mole of P_4 reacts with 8 moles of $SOCl_2$ to give 4 moles of A, x mole of SO_2 and 2 moles of B. A, B and x respectively are
(A) PCl_3, S_2Cl_2 and 4 (B) $POCl_3$, S_2Cl_2 and 4
(C) PCl_3, S_2Cl_2 and 2 (D) $POCl_3$, S_2Cl_2 and 2

73. Compound from the following that will not produce precipitate on reaction with $AgNO_3$ is :

(A) 

(B) 

(C) 

(D) 

74. A solution is prepared by adding 2g of "X" to 1 mole of water. Mass percent of "X" in the solution is :

(A) 20% (B) 5% (C) 2% (D) 10%

75. Given below are two statements :

Statement-I : In the metallurgy process, sulphide ore is converted to oxide before reduction.

Statement-II : Oxide ores in general are easier to reduce.

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

76. Alkali metal from the following with least melting point is :

(A) Rb (B) K (C) Na (D) Cs

77. What weight of glucose must be dissolved in 100 g of water to lower the vapour pressure by 0.20 mm Hg? (Assume dilute solution is being formed)

Given : Vapour pressure of pure water is 54.2 mm Hg at room temperature. Molar mass of glucose is 180 $g\ mol^{-1}$.

(A) 4.69 g (B) 3.59 g (C) 2.59 g (D) 3.69 g

78. The magnetic moment is measured in Bohr Magneton (BM).

Spin only magnetic moment of Fe in $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3+}$ complexes respectively is :

(A) 6.92 B.M. in both (B) 4.89 B.M. and 6.92 B.M.

(C) 3.87 B.M. and 1.732 B.M. (D) 5.92 B.M. and 1.732

79. Match List I with List II.

	List I Complex		**List II Colour**
A.	$Mg(NH_4)PO_4$	I.	Brown
B.	$K_3[Co(NO_2)_6]$	II.	White
C.	$MnO(OH)_2$	III.	Yellow
D.	$Fe_4[Fe(CN)_6]_3$	IV.	blue

Choose the correct answer from the options given below :

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

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

80. If Ni^{2+} is replaced by Pt^{2+} in the complex $[NiCl_2Br_2]^{2-}$, which of the following properties are expected to get changed ?

A. Geometry

B. Geometrical isomerism

C. Optical isomerism

D. Magnetic properties

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

SECTION - B

81. Number of compounds from the following which will not produce orange red precipitate with Benedict solution is .....

Glucose, maltose, sucrose, ribose, 2-deoxyribose, amylose, lactose.

82. 4.5 moles each of hydrogen and iodine is heated in a sealed ten litre vessel. At equilibrium, 3 moles of HI were found. The equilibrium constant for $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is .....

83. The number of correct statements about modern adsorption theory of heterogeneous catalysis from the following is

A. The catalyst is diffused over the surface of reactants.

B. Reactants are adsorbed on the surface of the catalyst.

C. Occurrence of chemical reaction on the catalyst's surface through formation of an intermediate.

D. It is a combination of intermediate compound formation theory and the old adsorption theory.

E. It explains the action of the catalyst as well as those of catalytic promoters and poisons.

84. The number of correct statements from the following

A. For 1s orbital, the probability density is maximum at the nucleus.

B. For 2s orbital, the probability density first increases to maximum and then decreases sharply to zero.

C. Boundary surface diagrams of the orbitals encloses a region of 100% probability of finding the electron.

D. p and d-orbitals have 1 and 2 angular nodes respectively.

E. Probability density of p-orbital is zero at the nucleus

85. The number of possible isomeric products formed when 3-chloro-1-butene reacts with HCl through carbocation formation is _____

86. $Mg(NO_3)_2 \cdot H_2O$ and $Ba(NO_3)_2 YH_2O$, represent formula of the crystalline forms of nitrate salts. Sum of X and Y is ____

87. The total number of intensive properties from the following is _____

Volume, Molar heat capacity, Molarity, E^{θ} cell, Gibbs free energy change, Molar mass, Mole

88. The maximum number of lone pairs of electrons on the central atom from the following species is ____

ClO_3^-, XeF_4, SF_4 and I_3^-

89. The volume of hydrogen liberated at STP by treating 2.4 g of magnesium with excess of hydrochloric acid is _____ $\times 10^{-2}$L.

Given : Molar volume of gas is 22.4 L at STP.

Molar mass of magnesium is 24 g mol^{-1}.

90. The number of correct statements from the following is :

A. Ecell is an intensive parameter.

B. A negative E^{Θ} means that the redox couple is a stronger reducing agent than the H+/H2 couple.

C. The amount of electricity required for oxidation or reduction depends on the stoichiometry of the electrode reaction.

D. The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte.

❐ ❐ ❐

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

ANSWER KEY

Mathematics

Single Choice Correct

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

Numerical Value

21.	2	22.	27	23.	285	24.	1680	25.	2
26.	360	27.	116	28.	11	29.	348	30.	16

Physics

Single Choice Correct

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

Numerical Value

51.	4	52.	3	53.	2	54.	5	55.	300
56.	625	57.	150	58.	80	59.	264	60.	98

Chemistry

Single Choice Correct

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

Numerical Value

81.	3	82.	1	83.	3	84.	3	85.	4
86.	6	87.	4	88.	3	89.	224	90.	4