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

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

1. Let the mean and variance of 12 observations be $\frac{9}{2}$ and 4 respectively. Later on, it was observed that two observations were considered as 9 and 10 instead of 7 and 14 respectively. If the correct variance is $\frac{m}{n}$, where m and n are co-prime, then m + n is equal to

(A) 316 (B) 314 (C) 317 (D) 315

2. Let a_n be the n^{th} term of the series $5 + 8 + 14 + 23 + 35 + 50 + \ldots$ and $S_n = \sum_{k=1}^{n} a_k$. Then $S_{30} - a_{40}$ is equal to

(A) 11310 (B) 11280 (C) 11290 (D) 11260

3. Let P be the plane passing through the line $\frac{x-1}{1} = \frac{y-2}{-3} = \frac{z+5}{7}$ and the point (2, 4, –3). If the image of the point (–1, 3, 4) in the plane P is (α, β, γ), then $\alpha + \beta + \gamma$ is equal to

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

4. Let $A = \left\{\theta \in (0,\ 2\pi) : \frac{1+2i\sin\theta}{1-i\sin\theta} \text{ is purely imaginary}\right\}$. Then the sum of the elements in A is

(A) π (B) 2π (C) 4π (D) 3π

5. The absolute difference of the coefficients of x^{10} and x^7 in the expansion of $\left(2x^2 + \frac{1}{2x}\right)^{11}$ is equal to

(A) $12^3 - 12$ (B) $11^3 - 11$ (C) $10^3 - 10$ (D) $13^3 - 13$

6. If the number of words, with or without meaning, which can be made using all the letters of the word MATHEMATICS in which C and S do not come together, is (6!)k, then k is equal to

(A) 1890 (B) 945 (C) 2835 (D) 5670

7. Let S be the set of all values of $\theta \in [-\pi, \pi]$ for which the system of linear equations

$$x + y + \sqrt{3}z = 0$$

$$-x + (\tan\theta)y + \sqrt{7}z = 0$$

$$x + y + (\tan\theta)z = 0$$

has non-trivial solution. Then $\frac{120}{\pi}\sum_{\theta \in S}\theta$ is equal to

(A) 40 (B) 10
(C) 20 (D) 30

8. If the probability that the random variable X takes values x is given by $P(X = x) = k(x + 1)3^{-x}$, x = 0, 1, 2, 3....., where k is a constant, then $P(X \geq 2)$ is equal to

(A) $\frac{7}{27}$ (B) $\frac{11}{18}$ (C) $\frac{7}{18}$ (D) $\frac{20}{27}$

9. The value of $36(4\cos^2 9^\circ - 1)(4\cos^2 27^\circ - 1)(4\cos^2 81^\circ - 1)(4\cos^2 243^\circ - 1)$ is

(A) 54 (B) 18 (C) 27 (D) 36

10. The integral $\int\left(\left(\frac{x}{2}\right)^x + \left(\frac{2}{x}\right)^x\right)\log_2 x\, dx$ is equal to

(A) $\left(\frac{x}{2}\right)^x + \left(\frac{2}{x}\right)^x + C$ (B) None of these

(C) $\left(\frac{x}{2}\right)^x \log_2\left(\frac{x}{2}\right) + C$ (D) $\left(\frac{x}{2}\right)^x \log_2\left(\frac{2}{x}\right) + C$

11. The area of the quadrilateral ABCD with vertices A(2, 1, 1), B(1, 2, 5), C (–2, –3, 5) and D (1, –6, – 7) is equal to

(A) 48 (B) $8\sqrt{38}$ (C) 54 (D) $9\sqrt{38}$

12. For $a, b \in Z$ and $|a - b| \leq 10$, let the angle between the plane P : ax + y – z = b and the line l : x – 1 = a – y = z + 1 be $\cos^{-1}\left(\frac{1}{3}\right)$. If the distance of the point (6, –6, 4) from the plane P is $3\sqrt{6}$, then $a^4 + b^2$ is equal to

(A) 25 (B) 85 (C) 48 (D) 32

13. $25^{190} - 19^{190} - 8^{190} + 2^{190}$ is divisible by

(A) 34 but not by 14 (B) both 14 and 34

(C) neither 14 nor 34 (D) 14 but not by 34

14. Let the vectors $\vec{u}_1 = \hat{i} + \hat{j} + a\hat{k}$, $\vec{u}_2 = \hat{i} + b\hat{j} + \hat{k}$ and $\vec{u}_3 = c\hat{i} + \hat{j} + \hat{k}$ be coplanar. If the vectors $\vec{v}_1 = (a + b)\hat{i} + c\hat{j} + c\hat{k}$, $\vec{v}_2 = a\hat{i} + (b + c)\hat{j} + a\hat{k}$ and $\vec{v}_3 = b\hat{i} + b\hat{j} + (c + a)\hat{k}$ are also coplnar, then 6(a + b + c) is equal to

(A) 0 (B) 6 (C) 12 (D) 4

15. Let O be the origin and OP and OQ be the tangents to the circle $x^2 + y^2 - 6x + 4y + 8 = 0$ at the point P and Q on it. If the circumcircle of the triangle OPQ passes through the point $\left(\alpha, \frac{1}{2}\right)$, then a value of α is

(A) $\frac{3}{2}$ (B) $\frac{5}{2}$ (C) 1 (D) $-\frac{1}{2}$

16. The negation of $(p \wedge (\sim q)) \vee (\sim p)$ is equivalent to

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

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

17. If $\alpha > \beta > 0$ are the roots of the equation $ax^2 + bx + 1 = 0$, and $\lim\limits_{x\to\frac{1}{\alpha}}\left(\frac{1-\cos(x^2+bx+a)}{2(1-\alpha x)^2}\right)^{\frac{1}{2}} = \frac{1}{k}\left(\frac{1}{\beta}-\frac{1}{\alpha}\right)$, then k is equal to

(A) 2β (B) 2α (C) α (D) β

18. If $A = \begin{bmatrix} 1 & 5 \\ \lambda & 10 \end{bmatrix}$, $A^{-1} = \alpha A + \beta I$ and $\alpha + \beta = -2$, then $4\alpha^2 + \beta^2 + \lambda^2$ is equal to :

(A) 12 (B) 10 (C) 19 (D) 14

19. Let A(0,1), B(1, 1) and C(1, 0) be the mid – points of the sides of a triangle with incentre at the point D. If the focus of the parabola $y^2 = 4ax$ passing through D is $(\alpha + \beta\sqrt{2}, 0)$, where α and β are rational numbers, then $\frac{\alpha}{\beta^2}$ is equal to

(A) 6 (B) 8 (C) 12 (D) $\frac{9}{2}$

20. Let A = {1, 2, 3, 4, 5, 6, 7}. Then the relation R = {(x, y) $\in$ A × A : x + y = 7} is
(A) transitive but neither symmetric nor reflexive
(B) reflexive but neither symmetric nor transitive
(C) an equivalence relation
(D) symmetric but neither reflexive nor transitive

SECTION - B

21. Let [t] denote the greatest integer function. If $\int_0^{2.4}[x^2]dx = \alpha + \beta\sqrt{2} + \gamma\sqrt{3} + \delta\sqrt{5}$, then $\alpha + \beta + \gamma + \delta$ is equal to _____

22. Let k and m be positive real numbers such that the function $f(x) = \begin{cases} 3x^2 + k\sqrt{x+1}, & 0 < x < 1 \\ mx^2 + k^2, & x \geq 1 \end{cases}$ is differentiable for all x > 0. Then $\frac{8f'(8)}{f'\left(\frac{1}{8}\right)}$ is equal to _____

23. Let $0 < z < y < x$ be three real numbers such that $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in an arithmetic progression and x, $\sqrt{2}$y, z are geometric progression. If $xy + yz + zx = \frac{3}{\sqrt{2}}xyz$, then $3(x + y + z)^2$ is equal to ____

24. If domain of the function $\log_e\left(\frac{6x^2+5x+1}{2x-1}\right) + \cos^{-1}\left(\frac{2x^2-3x+4}{3x-5}\right)$ is $(\alpha, \beta) \cup (\gamma, \delta]$, then $18(\alpha^2 + \beta^2 + \gamma^2 + \delta^2)$ is equal to _____

25. Let m and n be the numbers of real roots of the quadratic equations $x^2 - 12x + [x] + 31 = 0$ and $x^2 - 5|x + 2| - 4 = 0$ respectively, where [x] denotes the greatest integer $\le x$. Then $m^2 + mn + n^2$ is equal to ____.

26. The ordinates of the points P and Q on the parabola with focus (3, 0) and directrix x = –3 are in the ratio 3 : 1. If R(α, β) is the point of intersection of the tangents to the parabola at P and Q, then $\frac{\beta^2}{\alpha}$ is equal to

27. Let the solution curve x = x(y), $0 < y < \frac{\pi}{2}$, of the differential equation $(\log_e(\cos y))^2 \cos y\, dx - (1 + 3x \log_e(\cos y))\sin y\, dy = 0$ satisfy $x\left(\frac{\pi}{3}\right) = \frac{1}{2\log_e 2}$. If $x\left(\frac{\pi}{6}\right) = \frac{1}{\log_e m - \log_e n}$, where m and n are co-prime, then mn is equal to

28. Let P_1 be the plane $3x - y - 7z = 11$ and P_2 be the plane passing through the points (2, –1, 0), (2, 0, –1), and (5, 1, 1). If the foot of the perpendicular drawn from the point (7, 4, –1)on the line of intersection of the planes P_1 and P_2 is (α, β, γ), then $\alpha + \beta + \gamma$ is equal to ____.

29. Let R = {a, b, c, d, e} and S = {1, 2, 3, 4}. Total number of onto function $f : R \to S$ such that $f(a) \neq 1$, is equal to _____.

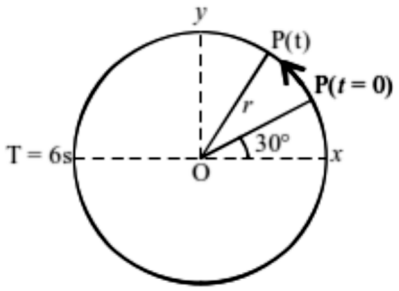
30. Let the area enclosed by the lines x + y = 2, y = 0, x = 0 and the curve $f(x) = \min\left\{x^2 + \frac{3}{4}, 1 + [x]\right\}$ where [x] denotes the greatest integer $\le x$, be A. Then the value of 12A is _____

PHYSICS Section - A (Single Correct Answer)

31. Electric potential at a point 'P' due to a point charge of 5×10^{-9} C is 50 V. The distance of 'P' from the point charge is: (Assume, $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^{+9}\ Nm^2C^{-2}$)

(A) 3 cm (B) 9 cm (C) 90 cm (D) 0.9 cm

32. For particle P revolving round the centre O with radius of circular path r and angular velocity ω, as shown in below figure, the projection of OP on the x-axis at time t is



(A) $x(t) = r\cos\left(\omega t + \frac{\pi}{6}\right)$ (B) $x(t) = r\cos(\omega t)$

(C) $x(t) = r\sin\left(\omega t + \frac{\pi}{6}\right)$ (D) $x(t) = r\cos\left(\omega t - \frac{\pi}{6}\omega\right)$

33. Match List I with List II

	LIST-I		LIST-II
A.	Torque	I.	$ML^{-2}T^{-2}$
B.	Stress	II.	$ML^{2}T^{-2}$
C.	Pressure gradient	III.	$ML^{-1}T^{-1}$
D.	Coefficient of viscosity	IV.	$ML^{-1}T^{-2}$

Choose the correct answer from the options given below:

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

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

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

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

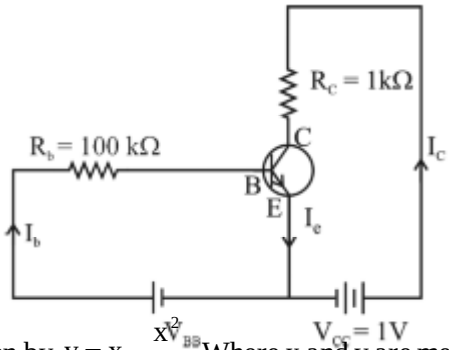
34. For a given transistor amplifier circuit in CE configuration V_{CC} = 1 V, R_c = 1 kΩ, R_b = 100 kΩ and β = 100. Value of base current I_b is

(A) I_b = 1.0 μA

(B) I_b = 0.10 μA

(C) I_b = 100 μA

(D) I_b = 10 μA



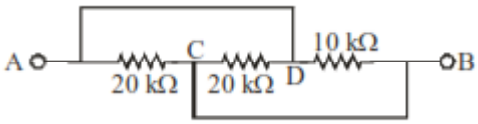
35. The trajectory of projectile, projected from the ground is given by $y = x - \frac{x^2}{20}$. Where x and y are measured in meter. The maximum height attained by the projectile will be.

(A) 5 m (B) $10\sqrt{2}$m (C) 200 m (D) 10 m

36. A radio-active material is reduced to 1/8 of its original amount in 3 days. If 8×10^{-3} kg of the material is left after 5 days. The initial amount of the material is

(A) 64 g (B) 40 g (C) 32 g (D) 256 g

37. The equivalent resistance between A and B as shown in figure is:



(A) 5 kΩ (B) 30 kΩ (C) 10 kΩ (D) 20 kΩ

38. A hydraulic automobile lift is designed to lift vehicles of mass 5000 kg. The area of cross section of the cylinder carrying the load is 250 cm^2. The maximum pressure the smaller piston would have to bear is [Assume g = 10 m/s^2] :

(A) $200 \times 10^{+6}$ Pa (B) $20 \times 10^{+6}$ Pa (C) $2 \times 10^{+6}$ Pa (D) $2 \times 10^{+5}$ Pa

39. The orbital angular momentum of a satellite is L, when it is revolving in a circular orbit at height h from earth surface. If the distance of satellite from the earth centre is increased by eight times to its initial value, then the new angular momentum will be-

(A) 8 L (B) 4 L (C) 9 L (D) 3 L

40. The temperature at which the kinetic energy of oxygen molecules becomes double than its value at 27°C is

(A) 1227° C (B) 927°C

(C) 327°C (D) 627°C

41. The acceleration due to gravity at height h above the earth if h << R (radius of earth) is given by

(A) $g' = g\left(1 - \frac{2h}{R}\right)$ (B) $g' = g\left(1 - \frac{2h^2}{R^2}\right)$

(C) $g' = g\left(1 - \frac{h}{2R}\right)$ (D) $g' = g\left(1 - \frac{h^2}{2R^2}\right)$

42. Work done by a Carnot engine operating between temperatures 127°C and 27°C is 2 kJ. The amount of heat transferred to the engine by the reservoir is:

(A) 4 kJ (B) 2 kJ (C) 8 kJ (D) 2.67 kJ

43. Given below are two statements:

Statement I: Area under velocity- time graph gives the distance travelled by the body in a given time.

Statement II: Area under acceleration- time graph is equal to the change in velocity- in the given time.

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

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

(C) Statement I is incorrect but Statement II is true. (D) Both Statement I and Statement II are False.

44. The waves emitted when a metal target is bombarded with high energy electrons are

(A) Microwaves (B) X-rays (C) Infrared rays (D) Radio Waves

45. The width of fringe is 2 mm on the screen in a double slits experiment for the light of wavelength of 400 nm. The width of the fringe for the light of wavelength 600 nm will be:

(A) 4 mm (B) 1.33 mm (C) 3 mm (D) 2 mm

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

Assertion A: Electromagnets are made of soft iron.

Reason R: Soft iron has high permeability and low retentivity.

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

(A) A is not correct but R is correct

(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 correct but R is not correct

47. In photo electric effect

A. The photocurrent is proportional to the intensity of the incident radiation.

B. Maximum Kinetic energy with which photoelectrons are emitted depends on the intensity of incident light.

C. Max. K.E with which photoelectrons are emitted depends on the frequency of incident light.

D. The emission of photoelectrons require a minimum threshold intensity of incident radiation.

E. Max. K.E of the photoelectrons is independent of the frequency of the incident light.

Choose the correct answer from the options given below:

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

48. An emf of 0.08 V is induced in a metal rod of length 10 cm held normal to a uniform magnetic field of 0.4 T, when moves with a velocity of:

(A) 2 ms^{-1} (B) 3.2 ms^{-1} (C) 0.5 ms^{-1} (D) 20 ms^{-1}

49. A bullet of mass 0.1 kg moving horizontally with speed 400 ms^{-1} hits a wooden block of mass 3.9 kg kept on a horizontal rough surface. The bullet gets embedded into the block and moves 20 m before coming to rest. The coefficient of friction between the block and the surface is_____. (Given g = 10 ms^2)

(A) 0.50 (B) 0.90 (C) 0.65 (D) 0.25

50. The power radiated from a linear antenna of length l is proportional to (Given, λ = Wavelength of wave):

(A) $\frac{l}{\lambda}$ (B) $\frac{l}{\lambda^2}$ (C) $\frac{l^2}{\lambda}$ (D) $\left(\frac{l}{\lambda}\right)^2$

SECTION - B

51. A series combination of resistor of resistance 100 Ω, inductor of inductance 1 H and capacitor of capacitance 6.25 μF is connected to an ac source. The quality factor of the circuit will be _____.

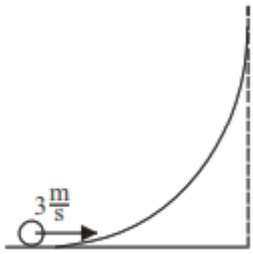
52. A guitar string of length 90 cm vibrates with a fundamental frequency of 120 Hz. The length of the string producing a fundamental frequency of 180 Hz will be _____ cm.

53. The ratio of wavelength of spectral lines H_α and H_β in the Balmer series is x/20. The value of x is _____.

54. The number density of free electrons in copper is nearly 8×10^{28} m^{-3}. A copper wire has its area of cross section = 2×10^{-6} m^2 and is carrying a current of 3.2 A. The drift speed of the electrons is _____ $\times 10^{-6}$ ms^{-1}.

55. A steel rod of length 1 m and cross sectional area 10^{-4} m^2 is heated from 0°C to 200°C without being allowed to extend or bend. The compressive tension produced in the rod is _____ $\times 10^4$ N.
(Given Young's modulus of steel = 2×10^{11} Nm^{-2}, coefficient of linear expansion = 10^{-5} K^{-1}.

56. A hollow spherical ball of uniform density rolls up a curved surface with an initial velocity 3 m/s (as shown in figure). Maximum height with respect to the initial position covered by it will be _____ cm.



57. A body of mass 5 kg is moving with a momentum of 10 kg ms^{-1}. Now a force of 2 N acts on the body in the direction of its motion for 5 s. The increase in the Kinetic energy of the body is _____ J.

58. A 600 pF capacitor is charged by 200V supply. It is then disconnected from the supply and is connected to another uncharged 600 pF capacitor. Electrostatic energy lost in the process is _____ μJ.

59. Two transparent media having refractive indices 1.0 and 1.5 are separated by a spherical refracting surface of radius of curvature 30 cm. The centre of curvature of surface is towards denser medium and a point object is placed on the principle axis in rarer medium at a distance of 15 cm from the pole of the surface. The distance of image from the pole of the surface is _____ cm.

60. The ratio of magnetic field at the centre of a current carrying coil of radius r to the magnetic field at distance r from the centre of coil on its axis is $\sqrt{x}:1$. The value of x is _____.

CHEMISTRY Section - A (Single Correct Answer)

61. Which of the following have same number of significant figures ?

A. 0.00253 **B.** 1.0003 **C.** 15.0 **D.** 163

Choose the correct answer from the options given below –

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

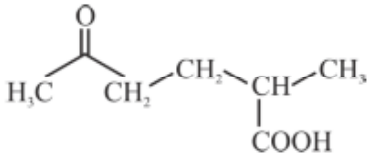
(C) A, C and D only (D) B and C only

62. Which of these reactions is not a part of breakdown of ozone in stratosphere ?

(A) $Cl\dot{O}(g) + O(g) \longrightarrow \dot{Cl}(g) + O_2(g)$ (B) $\dot{Cl}(g) + O_3(g) \longrightarrow Cl\dot{O}(g) + O_2(g)$

(C) $2Cl\dot{O} \longrightarrow ClO_2(g) + \dot{Cl}(g)$ (D) $CF_2Cl_2(g) \xrightarrow{uv} \dot{Cl}(g) + \dot{C}F_2Cl(g)$

63. The correct IUPAC nomenclature for the following compound is



(A) 5–Formyl–2–methylhexanoic acid (B) 2–Methyl–5–oxohexanoic acid

(C) 2–Formyl–5–methylhexan–6–oic acid (D) 5–Methyl–2–oxohexan–6–oic acid

64. Arrange the following gases in increasing order of van der Waals constant 'a' :

A. Ar **B.** CH_4 **C.** H_2O **D.** C_6H_6

Choose the correct option from the following –

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

65. Given below are two statements –

Statement I : Methyl orange is a weak acid.

Statement II : The benzenoid form of methyl orange is more intense/deeply coloured than the quinonoid form.

In the light of the above statement, 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 and Statement II are incorrect.

(D) Both statement I and Statement II are correct.

66. Given below are two statements –

Statement I : In redox titration, the indicators used are sensitive to change in pH of the solution.

Statement II : In acid-base titration, the indicators used are sensitive to change in oxidation potential.

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

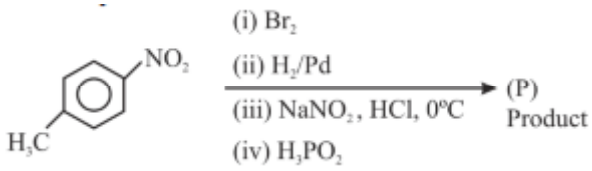
(A) Both statement I and statement II are correct.

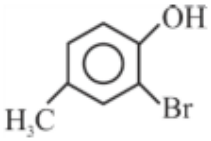
(B) Statement I is incorrect but Statement II is correct.

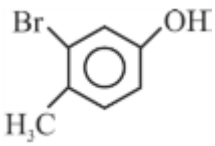
(C) Statement I is correct but Statement II is incorrect.

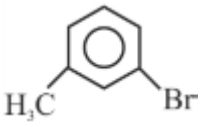
(D) Both statement I and statement II are incorrect.

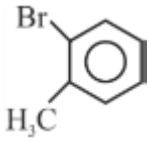
67. The product (P) formed from the following multistep reaction is :



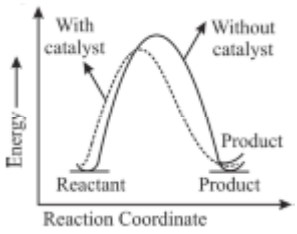
(A) 

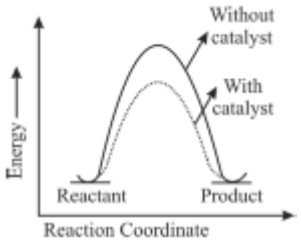
(B) 

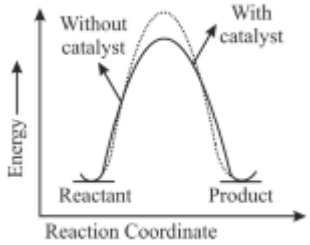
(C) 

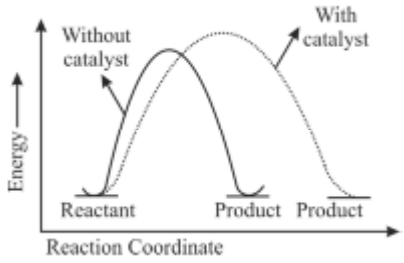
(D) 

68. The correct reaction profile diagram for a positive catalyst reaction.

(A) 

(B) 

(C) 

(D) 

69. Which of the following can reduce decomposition of H_2O_2 on exposure to light.

(A) Alkali (B) Urea (C) Dust (D) Glass containers

70. The statement/s which are true about antagonists from the following is/are :

A. They bind to the receptor site.

B. Get transferred inside the cell for their action.

C. Inhibit the natural communication of the body.

D. Mimic the natural messenger.

Choose the **correct** answer from the options given below –

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

71. Match List I with List II :

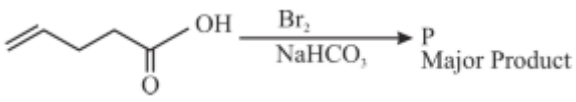
	List I **Coordination Complex**		**List II** **Number of unpaired electrons**
A.	$[Cr(CN)_6]^{3-}$	I.	0
B.	$[Fe(H_2O)_6]^{2+}$	II.	3
C.	$[Co(NH_3)_6]^{3+}$	III.	2
D.	$[Ni(NH_3)_6]^{2+}$	IV.	4

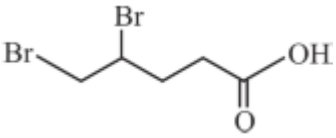
Choose the correct answer from the options given below :

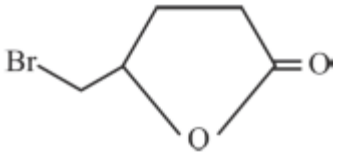
(A) A – II, B – IV, C – I, D – III (B) A – IV, B – III, C – II, D – I

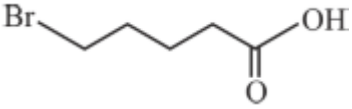
(C) A – III, B – IV, C – I, D – II (D) A – II, B – I, C – IV, D – III

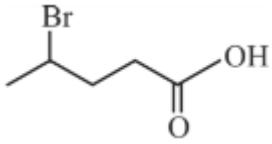
72. Major product 'P' formed in the following reaction is :



(A) 

(B) 

(C) 

(D) 

73. In Hall – Heroult process, the following is used for reducing Al_2O_3 :

(A) Graphite (B) Magnesium (C) Na_3AlF_6 (D) CaF_2

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

Assertion A : Sodium is about 30 times as abundant as potassium in the oceans.

Reason R : Potassium is bigger in size than sodium.

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) A is false but R is true

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

75. Math List I with List II.

Choose the **correct** answer from the options given below :

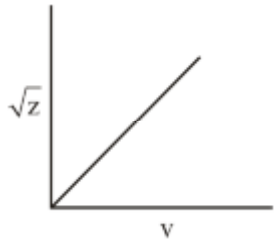
	List I (Natural amino acid)		**List II (One letter code)**
A.	Glutamic acid	I.	Q
B.	Glutamine	II.	W
C.	Tyrosine	III.	E
D.	Tryptophan	IV.	Y

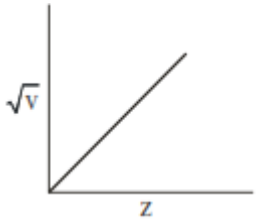
(A) A-II, B-I, C-IV, D-III (B) A-IV, B-III, C-I, D-II

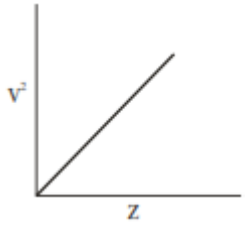
(C) A-III, B-I, C-IV, D-II (D) A-III, B-IV, C-I, D-II

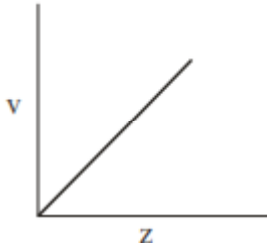
76. Henry Moseley studied characteristic X-ray spectra of elements. The graph which represents his observation correctly is :

(Given v = frequency of X-ray emitted; Z = atomic number)

(A) 

(B) 

(C) 

(D) 

77. The descending order of acidity for the following carboxylic acid is :

A. CH_3COOH **B.** $F_3C–COOH$

C. $ClCH_2–COOH$ **D.** $FCH_2–COOH$

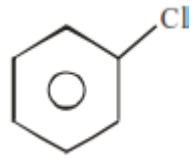
E. $BrCH_2–COOH$

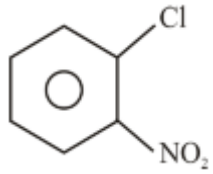
Choose the **correct** answer from the options given below :

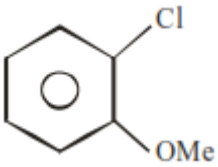
(A) D > B > A > E > C (B) E > D > B > A > C

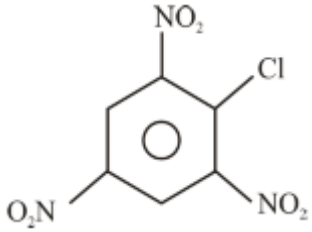
(C) B > C > D > E > A (D) B > D > C > E > A

78. The correct order of reactivity of following haloarenes towards nucleophilic substitution with aqueous NaoH is :

A. 

B. 

C. 

D. 

Choose the **correct** answer from the options given below –

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

79. For a good quality cement, the ratio of lime to the total of the oxides of Si, Al and Fe should be as close as to :

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

80. A compound 'X' when treated with phthalic anhydride in presence of concentrated H_2SO_4 yields 'Y'. 'Y' is used as an acid/base indicator. 'X' and 'Y' are respectively :

(A) Carbolic acid, Phenolphthalein

(B) Anisole, methyl orange

(C) Salicylaldehyde, Phenolphthalein

(D) Toludine, Phenolphthalein

SECTION - B

81. The solubility product of $BaSO_4$ is 1×10^{-10} at 298 K. The solubility of $BaSO_4$ in 0.1 M K_2SO_4(aq) solution is _____ $\times 10^{-9}$ g L^{-1}.

(nearest integer)

Given : Molar mass of $BaSO_4$ is 233 g mol^{-1}

82. Coagulating value of electrolytes $AlCl_3$ and NaCl for As_2S_3 are 0.09 and 50.04 respectively. The coagulating power of $AlCl_3$ is x times the coagulating power of NaCl. The value of x is _____.

83. The number of atomic orbitals from the following having 5 radial nodes is _____.

7s, 7p, 6s, 8p, 8d

84. For complete combustion of ethene.

$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(\ell)$

the amount of heat produced as measured in bomb calorimeter is 1406 kJ mol^{-1} at 300 K. The minimum value of $T\Delta S$ needed to reach equilibrium is (–) _____ kJ.

(Nearest integer)

Given : R = 8.3 JK^{-1} mol^{-1}

85. The number of species from the following carrying a single lone pair on central atom Xenon is ____.

XeF_5^+, XeO_3, XeO_2F_2, XeF_5^-, XeO_3F_2, $XeOF_4$, XeF_4

86. If the boiling points of two solvents X & Y (having same molecular weights) are in the ratio 2 : 1 and their enthalpy of vaporizations are in the ratio 1 : 2, then the boiling point elevation constant of X is m times the boiling point elevation constant of Y. The value of m is _____.

(Nearest integer)

87. The sum of oxidation state of the metals in $Fe(CO)_5$, VO^{2+} and WO_3 is _____.

88. The observed magnetic moment of the complex $[Mn(NCS)_6]^{x-}$ is 6.06 BM. The numerical value of x is _____.

89. The number of incorrect statements from the following is _____.

A. The electrical work that a reaction can perform at constant pressure and temperature is equal to the reaction Gibbs energy.

B. E^o_{cell} is dependent on the pressure.

C. $\frac{dE^o_{cell}}{dT} = \frac{\Delta_r S^o}{nF}$

D. A cell is operating reversibly if the cell potential is exactly balanced by an opposing source of potential difference.

90. The ratio of sigma and π bonds present in pyrophosphoric acid is _____.

❐ ❐ ❐

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

ANSWER KEY

Mathematics

Single Choice Correct

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

Numerical Value

21.	6	22.	309	23.	150	24.	20	25.	9
26.	16	27.	12	28.	11	29.	180	30.	17

Physics

Single Choice Correct

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

Numerical Value

51.	4	52.	60	53.	27	54.	125	55.	4
56.	75	57.	30	58.	6	59.	30	60.	8

Chemistry

Single Choice Correct

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

Numerical Value

81.	233	82.	556	83.	3	84.	1411	85.	4
86.	8	87.	10	88.	4	89.	1	90.	6