

JEE Main 2023 April 13 Shift 2 Question Paper

Time Allowed :3 Hours

Maximum Marks :300

Total Questions :90

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 90 questions, out of which 75 are to attempted.
The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
4. Each part (subject) has two sections.
 - (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each question carries 4 marks for correct answer and –1 mark for wrong answer.
 - (ii) Section-B: This section contains 10 questions. In Section-B, attempt any five questions out of 10. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer

Mathematics

Section-A

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

- (1) $\frac{3}{4}(4\sqrt{2} + 1)$
- (2) $\frac{4}{3}(4\sqrt{2} - 1)$
- (3) $\frac{3}{4}(4\sqrt{2} - 1)$
- (4) $\frac{4}{3}(4\sqrt{2} + 1)$

2. If

$$\lim_{x \rightarrow 0} \frac{e^x - \cos(bx) - cx}{1 - \cos(2x)} = 2,$$

then $5a^2 + b^2$ is equal to:

- (1) 76
 - (2) 72
 - (3) 64
 - (4) 68
-

3. The line, that is coplanar to the line

$$\frac{x+1}{-3} = \frac{y-2}{1} = \frac{z-5}{5},$$

is:

- (1) $\frac{x+1}{-3} = \frac{y-2}{2} = \frac{z-5}{5}$
 - (2) $\frac{x+1}{-3} = \frac{y-2}{-2} = \frac{z-5}{5}$
 - (3) $\frac{x-1}{-2} = \frac{y-2}{2} = \frac{z-5}{4}$
 - (4) $\frac{x-1}{-2} = \frac{y-2}{5} = \frac{z-5}{4}$
-

4. 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

- (1) $(0, 5, -2)$
 - (2) $(-2, 5, 0)$
 - (3) $(2, 0, 1)$
 - (4) $(1, -2, 1)$
-

5. Let for a triangle ABC,

$$\overrightarrow{AB} = -2\hat{i} + \hat{j} + 3\hat{k}, \quad \overrightarrow{CB} = \hat{i} + \hat{j} + \hat{k}, \quad \overrightarrow{CA} = 4\hat{i} + 3\hat{j} + 4\hat{k}$$

If $\lambda = 0$ and the area of triangle ABC is $5\sqrt{6}$, then CB is equal to:

- (1) 108
- (2) 60

- (3) 54
(4) 120
-

6. Let for

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 1 & 2 \end{pmatrix}, \quad |A| = 2. \quad \text{If } |2 \operatorname{adj}(2A)| = 32, \quad \text{then } 3n + \alpha \text{ is equal to:}$$

- (1) 10
(2) 9
(3) 12
(4) 11
-

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

- (1) $(0, \infty)$
(2) $(0, \pi)$
(3) $[0, 2\pi]$
(4) $[0, \pi]$
-

8. Let $a_1, a_2, a_3, \dots$ 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 $6a_6 + a_6a_8$ is equal to:

- (1) 2
(2) 3
(3) $3\sqrt{5}$
(4) $2\sqrt{5}$
-

9. If the system of equations

$$2x + y = -52x - 5y + z = -9x + 2y - 5z = 7$$

has infinitely many solutions, then $(x + y)^2 + (y + z)^2$ is equal to:

- (1) 904
 - (2) 916
 - (3) 912
 - (4) 920
-

10. The statement

$$(p \rightarrow q) \rightarrow (r \rightarrow q) \equiv (p \vee q) \rightarrow (r \vee q)$$

is equivalent to:

- (1) $p \vee q$
 - (2) $p \rightarrow (q \rightarrow p)$
 - (3) $p \vee (q \vee r)$
 - (4) $p \vee q \rightarrow r$
-

11. Let $S = \{z \in \mathbb{C} : z = i(z^2 + \operatorname{Re}(z))\}$. **Then** $\sum_{z \in S} |z|^2$ **is equal to:**

- (1) 4
 - (2) $\frac{7}{2}$
 - (3) 3
 - (4) $\frac{5}{2}$
-

12. Let α, β **be the roots of the equation** $x^2 - \sqrt{5}x + 2 = 0$. **Then** $\alpha^4 + \beta^4$ **is equal to:**

- (1) -64
 - (2) -128
 - (3) 64
 - (4) -256
-

13. Let $|a| = 2, |b| = 3$ **and the angle between the vectors** a **and** b **be** $\frac{\pi}{4}$. **Then** $|a + 2b| \times |2a - 3b|$ **is equal to:**

- (1) 482
- (2) 841

(3) 882

(4) 441

14. The value of

$$\int_0^{\frac{\pi}{4}} \frac{e^x}{(e^x + \tan^2 x)} dx$$

is:

(1) 25

(2) 51

(3) 50

(4) 49

15. The coefficient of x^2 in the expansion of

$$\left(2x^2 - \frac{1}{3x^3}\right)^5$$

is:

(1) $\frac{80}{9}$

(2) 8

(3) 9

(4) $\frac{26}{3}$

16. The random variable X follows binomial distribution B (n, p), for which the difference of the mean and the variance is 1. If

$${}^{12}P(X = x) - {}^{20}P(X = 3X - 1), \quad \text{then } np(X)^2 \text{ is equal to}$$

(1) 16

(2) 11

(3) 12

(4) 15

17. Let the center of a circle C be (α, β) and its radius $r < 8$. Let $3x + 4y - 24 = 0$ and $3x - 4y - 32 = 0$ be two tangents, and $4x + 3y = 1$ be a normal to C . Then the value of $(\alpha - \beta)$ is:

- (1) 5
 - (2) 6
 - (3) 7
 - (4) 9
-

18. 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 $2x - 2y + z = 5$ is:

- (1) 6
 - (2) 7
 - (3) 9
 - (4) 8
-

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

- (1) 328
 - (2) 327
 - (3) 324
 - (4) 326
-

20. Let α, β be the centroid of the triangle formed by the lines $15x + y = 82$, $6x - 5y = -4$, and $9x + 4y = 17$. Then α and β are the roots of the equation:

- (1) $x^2 - 13x + 42 = 0$
 - (2) $x^2 - 10x + 25 = 0$
 - (3) $x^2 - 7x + 12 = 0$
 - (4) $x^2 - 14x + 48 = 0$
-

Section - B

21. Let $A = \{-4, -3, 2, 0, 1, 3, 4\}$ and $R = \{(a, b) : a \in A, b = |a| \text{ or } a = b\}$ 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:

22. Let $f = \left(\sum_{k=1}^{\infty} \sin^k x\right) \left(\sum_{k=1}^{\infty} \sin^k x\right) \cos x dx \in N$. Then f_{11} is equal to:

23. If $y = y(x)$ is the solution of the differential equation

$$\frac{dy}{dx} = \frac{4x}{(x-1)^2} - \frac{x^2-2}{(x-1)^3} \text{ such that } y(2) = \frac{2}{9} \log_2 (2 + \sqrt{5})$$

and $y(x) = \alpha \log(\sqrt{x+\beta}) + \gamma \cdot \sqrt{x} - \frac{1}{x}$, then $\alpha\beta\gamma$ is equal to:

24. Total numbers 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. The remainder, when 7^{110} is divided by 17, is _____.

26. Let $f(x) = \sum_{k=1}^{\infty} x^k$, where $x \in \mathbb{R}$ and $f(2) = 119$. Then $f(2) - f(1)$ is equal to _____.

28. 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 _____.

29. The foci of a hyperbola are $(\pm 2, 0)$ and its eccentricity is $\frac{3}{2}$. A tangent, perpendicular to the line $2x + 3y - 6 = 0$, 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 $|a| + |b|$ is equal to _____.

30. Let $[\alpha]$ denote the greatest integer $\leq \alpha$. Then $[\sqrt{1}] + [\sqrt{2}] + [\sqrt{3}] + \dots + [\sqrt{20}]$ is equal to _____.

Physics

Section-A

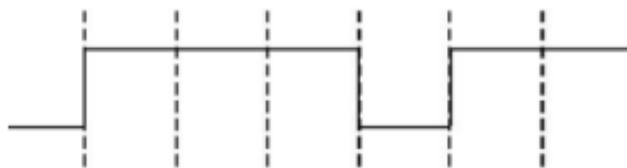
31. Given below are two statements: Statement I: An AC circuit undergoes electrical resonance if it contains either a capacitor or an inductor. **Statement II:** An AC circuit containing a pure capacitor or a pure inductor consumes high power due to its non-zero power factor.

- (1) Statement I is false but Statement II is true
 - (2) Statement I is true but Statement II is false
 - (3) Both Statement I and Statement II are false
 - (4) Both Statement I and Statement II are true
-

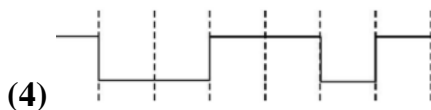
32. A passenger sitting in a train A moving at 90 km/h observes another train B moving in the opposite direction for 8 s. If the velocity of the train B is 54 km/h, then the length of train B is:

- (1) 120 m
 - (2) 200 m
 - (3) 320 m
 - (4) 80 m
-

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



- (1)
- (2)
- (3)



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

- (1) 25 m/s
- (2) 12.5 m/s
- (3) 5 m/s
- (4) 62.5 m/s

35. 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:

- (1) 9 : 1
- (2) 9 : 4
- (3) 2 : 1
- (4) 25 : 9

36. 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.

- (1) Both A and R are true but R is NOT the correct explanation of A
- (2) Both A and R are true and R is the correct explanation of A
- (3) A is true but R is false
- (4) A is false but R is true

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

- (1) 2 : 3
- (2) 2 : 1
- (3) 4 : 3
- (4) 3 : 4

38. 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 373 K is approximately:

- (1) $750d$
- (2) $1500d$
- (3) $1098d$
- (4) $2049d$

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

- (1) λ
- (2) $\frac{\lambda}{2}$
- (3) 2λ
- (4) $\frac{\lambda}{4}$

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

- (1) $\sqrt{2}A$
- (2) $\frac{1}{2}A$
- (3) $\frac{1}{\sqrt{2}}A$
- (4) $2A$

41. 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:

- (1) negative y-axis
- (2) at 45° angle from positive y-axis
- (3) positive y-axis
- (4) positive z-axis

42. 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.

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true

43. 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.

- (1) Both Statement I and Statement II are correct
- (2) Statement I is correct but Statement II is incorrect
- (3) Statement I is incorrect but Statement II is correct
- (4) Both Statement I and Statement II are incorrect

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: (1) 2800 N
(2) 560 N

(3) 2240 N

(4) 14 N

45. A $10 \mu\text{C}$ 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:

(1) $7 \mu\text{C}$, $3 \mu\text{C}$

(2) $8 \mu\text{C}$, $2 \mu\text{C}$

(3) $9 \mu\text{C}$, $1 \mu\text{C}$

(4) $5 \mu\text{C}$, $5 \mu\text{C}$

46. In the equation $[x + \frac{a}{y}][Y - b] = RT$, where X is pressure, Y is volume, R is universal gas constant and T is temperature. The physical quantity equivalent to the ratio $\frac{a}{b}$ is: (1)
Coefficient of viscosity

(2) Energy

(3) Impulse

(4) Pressure gradient

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

(1) B and E only

(2) A and E only

(3) B and D only

(4) C and D only

48. 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.

- (1) Both A and R are true but R is NOT the correct explanation of A
 - (2) Both A and R are true and R is the correct explanation of A
 - (3) A is false but R is true
 - (4) A is true but R is false
-

49. The initial pressure and volume of an ideal gas are P_1 and V_1 . The final pressure of the gas when the gas is suddenly compressed to volume $\frac{V_1}{4}$ will be:

- (1) $P_1 \left(\frac{V_1}{4}\right)^\gamma$
 - (2) $4P_1$
 - (3) P_0
 - (4) $P_1 \left(\frac{V_1}{4}\right)^{\gamma-1}$
-

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

- (1) $4.8 \mu C$
 - (2) $12 \mu C$
 - (3) $7.2 \mu C$
 - (4) $10.3 \mu C$
-

Section-B

51. 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

52. Two plates A and B have thermal conductivities $84 \text{ W/m}\cdot\text{K}$ and $126 \text{ W/m}\cdot\text{K}$ 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

53. In the circuit shown below, the energy stored in the capacitor is $3\mu\text{J}$. The value of n is _____.

54. 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

55. 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. The magnitude of the current required in the wire to remove the tension in the supporting leads is _____ A. (Take $g = 10\text{ m/s}^2$)

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

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

59. 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 $3 \times 10^{-4}\text{ eV}$. The value of h is _____.

60. A car accelerates from rest to 2 m/s. The energy spent in this process is E_1 . The energy required to accelerate the car from 1 m/s to 2 m/s is E_2 . The value of E_1 is

Chemistry

Section-A

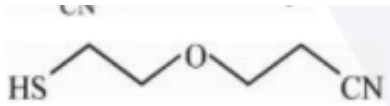
61. Which of the following are the Green house gases ?

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

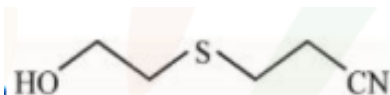
62. The major product for the following reaction is :



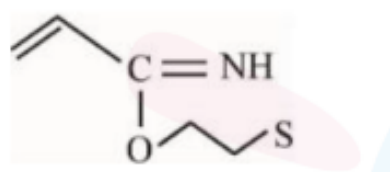
(1) (A)



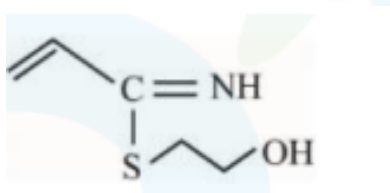
(2) (B)



(3) (C)



(4) (D)

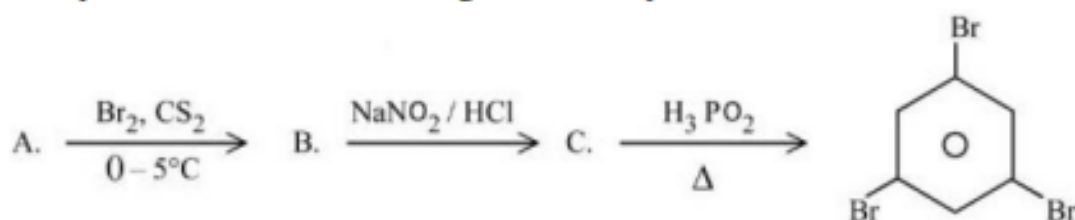


63. In the wet tests for detection of various cations by precipitation, Ba^{2+} cations are detected by obtaining precipitate of :

- (1) $\text{Ba}(\text{OAc})_2$
 - (2) BaCO_3
 - (3) BaSO_4
 - (4) $\text{Ba}(\text{ox})$: Barium oxalate
-

64. Compound A from the following reaction sequence is:

The reaction sequence:



- (1) Phenol
 - (2) Benzoic Acid
 - (3) Aniline
 - (4) Salicylic Acid
-

65. 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.

- (1) A is not correct but R is correct
 - (2) Both A and R are correct but R is NOT the correct explanation of A
 - (3) Both A and R are correct and R is the correct explanation of A
 - (4) A is correct but R is not correct
-

66. Given below are statements related to Ellingham diagram:

Statement I: Ellingham diagram can be constructed for oxides, sulphides and halides of metals.

Statement II: It consists of plots of ΔH_f° vs formation of oxides of elements.

- (1) Statement I is correct but Statement II is incorrect
 - (2) Statement I is incorrect but Statement II is correct
 - (3) Both Statement I and Statement II are incorrect
 - (4) Both Statement I and Statement II are correct
-

67. Better method for preparation of BeF_2 , among the following is:

- (1) $\text{BeH}_4 + \text{F}_2 \rightarrow \text{BeF}_2$
 - (2) $\text{Be} + \text{F}_2 \rightarrow \text{BeF}_2$
 - (3) $(\text{NH}_3)_2\text{BeF}_4 \rightarrow \text{BeF}_2$
 - (4) $\text{BeO} + \text{C} + \text{F}_2 \rightarrow \text{BeF}_2$
-

68. Identify the correct order of standard enthalpy of formation of sodium halides.

- (1) NaCl ; NaBr ; NaI ; NaCl
 - (2) NaF ; NaCl ; NaBr ; NaI
 - (3) NaCl ; NaF ; NaBr ; NaI
 - (4) NaI ; NaBr ; NaCl ; NaF
-

69. Which of the following complexes will exhibit maximum attraction to an applied magnetic field? (1) $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$

- (2) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
 - (3) $[\text{Co}(\text{en})_3]^{3+}$
 - (4) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
-

70. The correct group of halide ions which can be oxidized by oxygen in acidic medium is (1) Cl^- , Br^- and I^- only

- (2) Br^- only
- (3) Br^- and I^- only
- (4) I^- only

71. The total number of stereoisomers for the complex $[\text{Cr}(\text{ox})_3]^{3+}$ (where ox = oxalate) is: (1) 3

(2) 1

(3) 4

(4) 2

72. Match List I with List II I - Bromo propene is reacted with reagents in List I to give product in List II.

LIST I - Reagent LIST II - Product

(1) KOH (alc) Nitrite

(2) KCN (alc) Ester

(3) AgNO₃ Alkene

(4) H₂CO₃ Nitralkane

73. The covalency and oxidation state respectively of boron in $[\text{BF}_3]$ are: (1) 3 and 5

(2) 4 and 3

(3) 4 and 4

(4) 3 and 4

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

(1) System A: Temperature remains same System B: Temperature rises

(2) System A: Temperature falls System B: Temperature rises

(3) System A: Temperature falls System B: Temperature remains same

(4) System A: Temperature rises System B: Temperature remains same

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

- (1) Histidine
 - (2) Lysine
 - (3) Aspartic acid
 - (4) Arginine
-

76. 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

- (1) Both Statements I and Statement II are incorrect
 - (2) Both Statement I is correct but Statement II is incorrect
 - (3) Statement I is correct but Statement II is incorrect
 - (4) Statement I is incorrect but Statement II is correct
-

77. 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 direction when the size of particles is large enough.

- (1) Both A and R are correct but R is NOT the correct explanation of A
 - (2) Both A and R are correct and R is the correct explanation of A
 - (3) A is false but R is true
 - (4) A is correct but R is false
-

78. Match List I with List II I- Bromopropane is reacted with reagents in List I to give product in List II

- (1) A-IV, B-III, C-II, D-I
 - (2) A-II, B-I, C-IV, D-III
 - (3) A-I, B-II, C-III, D-IV
 - (4) A-IV, B-I, C-III, D-II
-

79. Given below are two statements: Statement I: Tropolone is an aromatic compound and

has 8π electrons. **Statement II:** The bond angle of C=O group in tropolone is involved in aromaticity.

- (1) Statement I is false but Statement II is true
 - (2) Statement I is true but Statement II is false
 - (3) Both Statement I and Statement II are true
 - (4) Both Statement I and Statement II are false
-

Section-B

81. If the formula of Borax is $\text{Na}_2\text{B}_4\text{O}_7 \cdot (\text{OH})_2$, then $x + y + z = ?$

The formula of borax is $\text{Na}_2\text{B}_4\text{O}_7 \cdot (\text{OH})_2$

82. Sea water contains 29.29% NaCl and 19% MgCl_2 by weight of solution. The normal boiling point of the sea water is:

83. 20 mL of 0.1 M NaOH is added to 50 mL of 0.1 M acetic acid solution. The pH of the resulting solution is:

84. At 298 K, the standard reduction potential for Cu^{2+}/Cu electrode is 0.034 V. Given: K_a , $\text{Cu}(\text{OH})_2 = 1 \times 10^{-9}$. The reduction potential at pH = 14 for the above couple is (X) $\times 10^{-7}$. The value of X is:

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

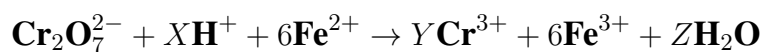
86. $\text{A (g)} \rightarrow 2\text{B (g)} + \text{C (g)}$ is first order reaction. The initial pressure of the system was found to be 800 mm Hg which increased to 1600 mm Hg after 10 min. The total pressure of the system after 30 min will be _____ mm Hg.

87. 1g 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 (Nearest integer).

88. 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:

89. The orbital angular momentum of an electron in a 3s orbital is $\frac{xh}{2\pi}$. The value of x is ____ (nearest integer).

90. See the following chemical reaction:



The sum of X , Y and Z is ____.
