JEE Main 2023 April 10 Shift 1 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

Question 1: An arc PQ of a circle subtends a right angle at its centre O. The midpoint of the arc PQ is R. If $\vec{OP} = \vec{u}$, $\vec{OR} = \vec{v}$ and $\vec{OQ} = \alpha\vec{u} + \beta\vec{v}$, then α, β^2 are the roots of the equation:

(1) $3x^2 - 2x - 1 = 0$

(2) $3x^2 + 2x - 1 = 0$

(3) $x^2 - x - 2 = 0$

(4) $x^2 + x - 2 = 0$

Question 2: A square piece of tin of side 30 cm is to be made into a box without top by cutting a square from each corner and folding up the flaps to form a box. If the volume of the box is maximum, then its surface area (in cm^2) is equal to :

(1) 800

(2) 1025

(3) 900

(4) 675

Question 3: Let O be the origin and the position vector of the point P be $\hat{-}i - 2\hat{j} + 3\hat{k}$. If the position vectors of the A, B and C are $-2\hat{i} + \hat{j} - 3\hat{k}$, $2\hat{i} + 4\hat{j} - 2\hat{k}$ and $-4\hat{i} + 2\hat{j} - \hat{k}$ respectively, then the projection of the vector $\vec{OP}$ on a vector perpendicular to the vectors $\vec{AB}$ and $\vec{AC}$ is:

(1) $\frac{10}{3}$

(2) $\frac{8}{3}$

(3) $\frac{7}{3}$

(4) 3

Question 4: If A is a 3×3 matrix and $|A| = 2$, then $|3\textbf{adj}(|3A|A^2)|$ is equal to :

(1) $3^{12} \cdot 6^{10}$

(2) $3^{11} \cdot 6^{10}$

(3) $3^{12} \cdot 6^{11}$

(4) $3^{10} \cdot 6^{11}$

Question 5: Let two vertices of a triangle ABC be $(2, 4, 6)$ and $(0, -2, -5)$, and its centroid be $(2, 1, -1)$. If the image of the third vertex in the plane $x + 2y + 4z = 11$ is (α, β, γ), then $\alpha\beta + \beta\gamma + \gamma\alpha$ is equal to:

(1) 76

(2) 74

(3) 70

(4) 72

Question 6: The negation of the statement $(p \vee q) \wedge (q \vee (\sim r))$ is

(1) $((\sim p) \vee r) \wedge (\sim q)$

(2) $((\sim p) \vee (\sim q)) \wedge (\sim r)$

(3) $((\sim p) \vee (\sim q)) \vee (\sim r)$

(4) $(p \vee r) \wedge (\sim q)$

Question 7: The shortest distance between the lines $\frac{x+2}{1} = \frac{y}{-2} = \frac{z-5}{2}$ and $\frac{x-4}{1} = \frac{y-1}{2} = \frac{z+3}{0}$ is:

(1) 8

(2) 7

(3) 6

(4) 9

Question 8: If the coefficient of x^7 in $\left(ax - \frac{1}{bx^2}\right)^{13}$ and the coefficient of x^{-5} in $\left(ax + \frac{1}{bx^2}\right)^{13}$ are equal, then a^4b^4 is equal to:

(1) 22

(2) 44

(3) 11

(4) 33

Question 9: A line segment AB of length λ moves such that the points A and B remain on the periphery of a circle of radius γ. Then the locus of the point, that divides the line segment AB in the ratio 2 : 3, is a circle of radius :

(1) $\frac{2}{3}\lambda$

(2) $\frac{\sqrt{19}}{7}\lambda$

(3) $\frac{3}{5}\lambda$

(4) $\frac{\sqrt{19}}{5}\lambda$

Question 10: For the system of linear equations

$$2x - y + 3z = 5$$

$$3x + 2y - z = 7$$

$$4x + 5y + \alpha z = \beta,$$

which of the following is <u>NOT</u> correct ?

(1) The system in inconsistent for $\alpha = -5$ and $\beta = 8$

(2) The system has infinitely many solutions for $\alpha = -6$ and $\beta = 9$

(3) The system has a unique solution for $\alpha \neq -5$ and $\beta = 8$

(4) The system has infinitely many solutions for $\alpha = -5$ and $\beta = 9$

Question 11: Let the first term a and the common ratio r of a geometric progression be positive integers. If the sum of squares of its first three is 33033, then the sum of these terms is equal to:

(1) 210

(2) 220

(3) 231

(4) 241

Question 12: Let P be the point of intersection of the line $\frac{x+3}{3} = \frac{y+2}{1} = \frac{1-z}{2}$ **and the plane** $x + y + z = 2$**. If the distance of the point P from the plane** $3x - 4y + 12z = 32$ **is q, then q and 2q are the roots of the equation:**

(1) $x^2 + 18x - 72 = 0$

(2) $x^2 + 18x + 72 = 0$

(3) $x^2 - 18x - 72 = 0$

(4) $x^2 - 18x + 72 = 0$

Question 13: Let f be a differentiable function such that $x^2 f(x) - x = 4\int_0^x tf(t)dt$**,** $f(1) = \frac{2}{3}$**. Then** $18f(3)$ **is equal to:**

(1) 180

(2) 150

(3) 210

(4) 160

Question 14: Let N denote the sum of the numbers obtained when two dice are rolled. If the probability that $2^N < N!$ is $\frac{m}{n}$, where m and n are coprime, then $4m - 3n$ equal to:

(1) 12

(2) 8

(3) 10

(4) 6

Question 15: If $I(x) = \int e^{\sin^2 x} \cos x \sin 2x - \sin x \, dx$ and $I(0) = 1$, then $I\left(\frac{\pi}{3}\right)$ is equal to:

(1) $e^{\frac{3}{4}}$

(2) $-e^{\frac{3}{4}}$

(3) $\frac{1}{2}e^{\frac{3}{4}}$

(4) $-\frac{1}{2}e^{\frac{3}{4}}$

Question 16: $96 \cos\frac{\pi}{33} \cos\frac{2\pi}{33} \cos\frac{4\pi}{33} \cos\frac{8\pi}{33} \cos\frac{16\pi}{33}$ is equal to :

(1) 4

(2) 2

(3) 3

(4) 1

Question 17: Let the complex number $z = x + iy$ be such that $\frac{2z-3i}{2z+i}$ is purely imaginary. If $x + y^2 = 0$, then $y^4 + y^2 - y$ is equal to:

(1) $\frac{3}{2}$

(2) $\frac{2}{3}$

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

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

Question 18: If $f(x) = \frac{(\tan 1^\circ)x + \log_e(123)}{x \log_e(1234) - (\tan 1^\circ)}$, $x > 0$, then the least value of $f(f(x)) + f\left(f\left(\frac{4}{x}\right)\right)$ is:

(1) 2

(2) 4

(3) 8

(4) 0

Question 19: The slope of tangent at any point (x, y) on a curve $y = y(x)$ is $\frac{x^2+y^2}{2xy}$, $x > 0$. If $y(2) = 0$, then a value of $y(8)$ is:

(1) $4\sqrt{3}$

(2) $-4\sqrt{2}$

(3) $-2\sqrt{3}$

(4) $2\sqrt{3}$

Question 20: Let the ellipse E : $x^2 + 9y^2 = 9$ intersect the positive x- and y-axes at the points A and B respectively. Let the major axis of E be a diameter of the circle C. Let the line passing through A and B meet the circle C at the point P. If the area of the triangle with vertices A, P and the origin O is $\frac{m}{n}$, where m and n are coprime, then m - n is equal to :

(1) 16

(2) 15

(3) 18

(4) 17

Section B

Question 21: Some couples participated in a mixed doubles badminton tournament. If the number of matches played, so that no couple in a match, is 840, then the total numbers of persons, who participated in the tournament, is _____.

Correct Answer: 16

Question 22: The number of elements in the set $\{n \in \mathbb{Z} : |n^2 - 10n + 19| < 6\}$ is _____.

Question 23: The number of permutations of the digits 1, 2, 3, ..., 7 without repetition, which neither contain the string 153 nor the string 2467, is _____.

Question 24: Let $f : (-2, 2) \to \mathbb{R}$ be defined by

$$f(x) = \begin{cases} x\lfloor x \rfloor, & -2 < x < 0 \\ (x-1)\lfloor x \rfloor, & 0 \le x < 2 \end{cases}$$

where $\lfloor x \rfloor$ denotes the greatest integer function. If m and n respectively are the number of points in (-2, 2) at which $y = |f(x)|$ is not continuous and not differentiable, then m + n is equal to _____.

Question 25: Let a common tangent to the curves $y^2 = 4x$ and $(x-4)^2 + y^2 = 16$ touch the curves at the points P and Q. Then $(PQ)^2$ is equal to _____.

Question 26: If the mean of the frequency distribution

Class	0-10	10-20	20-30	30-40	40-50
Frequency	2	3	x	5	4

is 28, then its variance is _____.

Question 27: The coefficient of x^7 in $(1 - x + 2x^3)^{10}$ is _____.

Question 28: Let $y = p(x)$ be the parabola passing through the points $(-1, 0)$, $(0, 1)$ and $(1, 0)$. If the area of the region $\{(x, y) : (x+1)^2 + (y-1)^2 \le 1, y \le p(x)\}$ is A, then $12(\pi - 4A)$ is equal to _____.

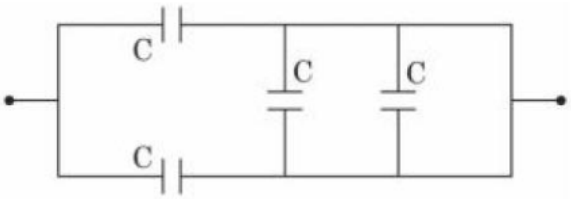
Question 29: Let a, b, c be three distinct positive real numbers such that $(2a)^{\log_e a} = (bc)^{\log_e b}$ and $b^{\log_e^2 a} = a^{\log_e c}$. Then $6a + 5bc$ is equal to _____.

Question 30: The sum of all those terms, of the arithmetic progression 3, 8, 13, ..., 373, which are *not* divisible by 3, is _____.

Physics

Section A

Question 31: The equivalent capacitance of the combination shown is



Where $C_1 = C_2 = C$ and $C_3 = C_4 = C$.

(1) 4C

(2) $\frac{5}{3}$C

(3) $\frac{C}{2}$

(4) 2C

Question 32: Match List I with List II :

List I	List II
(A) 3 Translational degrees of freedom	(I) Monoatomic gases
(B) 3 Translational, 2 rotational degrees of freedoms	(II) Polyatomic gases
(C) 3 Translational, 2 rotational and 1 vibrational degrees of freedom	(III) Rigid diatomic gases
(D) 3 Translational, 3 rotational and more than one vibrational degrees of freedom	(IV) Nonrigid diatomic gases

Choose the correct answer from the options given below :

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

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

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

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

Question 33: Given below are two statements :

Statements I : If the number of turns in the coil of a moving coil galvanometer is doubled then the current sensitivity becomes double.

Statements II : Increasing current sensitivity of a moving coil galvanometer by only increasing the number of turns in the coil will also increase its voltage sensitivity in the same ratio

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

(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

Question 34: Given below are two statements:

Statement I: Maximum power is dissipated in a circuit containing an inductor, a capacitor and a resistor connected in series with an AC source, when resonance occurs

Statement II: Maximum power is dissipated in a circuit containing pure resistor due to zero phase difference between current and voltage.

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

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

(2) Both Statement I and Statement II are false

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

(4) Both Statement I and Statement II are true

Question 35: The range of the projectile projected at an angle of 15° with horizontal is 50 m. If the projectile is projected with same velocity at an angle of 45° with horizontal, then its range will be

(1) $100\sqrt{2}$m

(2) 50 m

(3) 100 m

(4) $50\sqrt{2}$m

Question 36: A particle of mass m moving with velocity v collides with a stationary particle of mass 2m. After collision, they stick together and continue to move together with velocity

(1) $\frac{v}{2}$

(2) $\frac{v}{3}$

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

(4) v

Question 37: Two satellites of masses m and 3m revolve around the earth in circular orbits of radii r & 3r respectively. The ratio of orbital speeds of the satellites respectively is

(1) $3:1$

(2) $1:1$

(3) $\sqrt{3}:1$

(4) $9:1$

Question 38: Assuming the earth to be a sphere of uniform mass density, the weight of a body at a depth $d = \frac{R}{2}$ from the surface of earth, if its weight on the surface of earth is 200 N, will be:

(1) 500 N

(2) 400 N

(3) 100 N

(4) 300 N

Question 39: The de Broglie wavelength of a molecule in a gas at room temperature (300 K) is λ_1. If the temperature of the gas is increased to 600 K, then the de Broglie wavelength of the same gas molecule becomes

(1) $2\lambda_1$

(2) $\frac{1}{\sqrt{2}}\lambda_1$

(3) $\sqrt{2}\lambda_1$

(4) $\frac{1}{2}\lambda_1$

Question 40: A physical quantity P is given as

$$P = \frac{a^2 b^3}{c\sqrt{d}}$$

The percentage error in the measurement of a, b, c and d are 1%, 2%, 3% and 4% respectively. The percentage error in the measurement of quantity P will be

(1) 14%

(2) 13%

(3) 16%

(4) 12%

Question 41: Consider two containers A and B containing monoatomic gases at the same Pressure (P), Volume (V) and Temperature (T). The gas in A is compressed isothermally to $\frac{1}{8}$ of its original volume while the gas in B is compressed adiabatically to $\frac{1}{8}$ of its original volume. The ratio of final pressure of gas in B to that of gas in A is

(1) 8

(2) 4

(3) $\frac{1}{8}$

(4) $8^{\frac{3}{2}}$

Question 42: Given below are two statements:

Statements I: Pressure in a reservoir of water is same at all points at the same level of water.

Statements II: The pressure applied to enclosed water is transmitted in all directions equally.

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

(1) Both Statements I and Statements II are false

(2) Both Statements I and Statements II are true

(3) Statements I is true but Statements II is false

(4) Statements I is false but Statements II is true

Question 43: The position-time graphs for two students A and B returning from school to their homes are shown in the figure.

[scale=0.8] [-¿] (0,0) – (4,0) node[right] t; [-¿] (0,0) – (0,4) node[above] x; (0,0) – (3,3) node[right] A; (0,0) – (3,2) node[right] B; at (0,0) [below left] O;

(A) A lives closer to the school

(B) B lives closer to the school

(C) A takes lesser time to reach home

(D) A travels faster than B

(E) B travels faster than A

Choose the correct answer from the options given below :

(1) (A) and (E) only

(2) (A), (C) and (E) only

(3) (B) and (E) only

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

Question 44: The energy of an electromagnetic wave contained in a small volume oscillates with

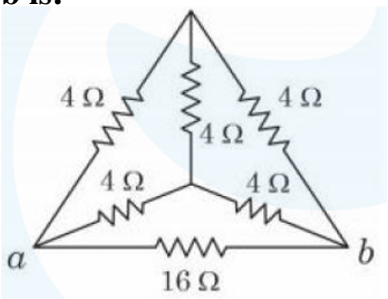
(1) double the frequency of the wave

(2) the frequency of the wave

(3) zero frequency

(4) half the frequency of the wave

Question 45: The equivalent resistance of the circuit shown below between points a and b is:



(1) $20\,\Omega$

(2) $16\,\Omega$

(3) $24\,\Omega$

(4) $3.2\,\Omega$

Question 46: A carrier wave of amplitude 15 V modulated by a sinusoidal base band signal of amplitude 3 V. The ratio of maximum amplitude to minimum amplitude in an amplitude modulated wave is

(1) 2

(2) 1

(3) 5

(4) $\frac{3}{2}$

Question 47: A particle executes S.H.M. of amplitude A along x-axis. At t = 0, the position of the particle is $x = -\frac{A}{2}$ and it moves along positive x-axis. The displacement of particle in time t is $x = A\sin(\omega t + \delta)$, then the value δ will be

(1) $\frac{\pi}{4}$

(2) $\frac{\pi}{2}$

(3) $\frac{\pi}{3}$

(4) $\frac{\pi}{6}$

Question 48: The angular momentum for the electron in Bohr's orbit is L. If the electron is assumed to revolve in second orbit of hydrogen atom, then the change in angular momentum will be

(1) $\frac{L}{2}$

(2) zero

(3) L

(4) 2L

Question 49: An object is placed at a distance of 12 cm in front of a plane mirror. The virtual and erect image is formed by the mirror. Now the mirror is moved by 4 cm towards the stationary object. The distance by which the position of image would be shifted, will be

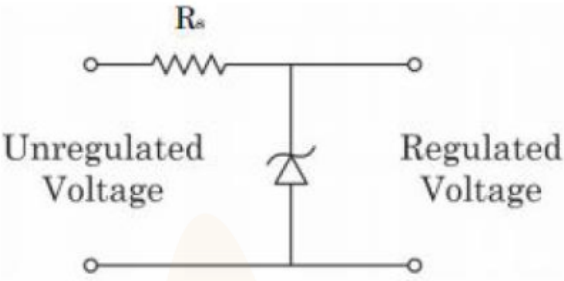
(1) 4 cm towards mirror

(2) 8 cm away from mirror

(3) 2 cm towards mirror

(4) 8 cm towards mirror

Question 50: A zener diode of power rating 1.6 W is used as a voltage regulator. If the zener diode has a breakdown voltage of 8 V and it has to regulate voltage fluctuating between 3 V and 10 V, what is the value of resistance R_s for safe operation of the diode?



(1) $13.3\,\Omega$

(2) $13\,\Omega$

(3) $10\,\Omega$

(4) $12\,\Omega$

Section B

Question 51: Unpolarised light of intensity 32 Wm^{-2} passes through the combination of three polaroids such that the pass axis of the last polaroid is perpendicular to that of the pass axis of first polaroid. If intensity of emerging light is 3 Wm^{-2}, then the angle between pass axis of first two polaroids is _____.$^\circ$

Question 52: If the earth suddenly shrinks to $\frac{1}{64}$th of its original volume with its mass remaining the same, the period of rotation of earth becomes $\frac{24}{x}$ h. The value of x is _____.

Question 53: Three concentric spherical metallic shells X, Y and Z of radius a, b and c respectively [a $<$ b $<$ c] have surface charge densities σ, $-\sigma$ and σ, respectively. The shells X and Z are at the same potential. If the radii of X & Y are 2 cm and 3 cm, respectively. The radius of shell Z is _____ cm.

Question 54: A transverse harmonic wave on a string is given by

$y(x,t) = 5\sin(6t + 0.003\,x)$

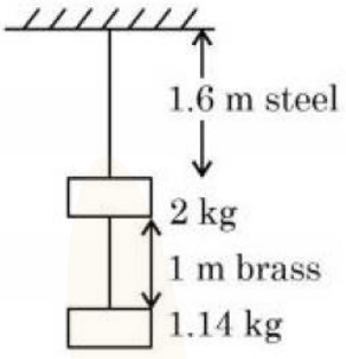
where x and y are in cm and t in sec. The wave velocity is _____ ms^{-1}.

Question 55: 10 resistors each of resistance $10\,\Omega$ can be connected in such as to get maximum and minimum equivalent resistance. The ratio of maximum and minimum equivalent

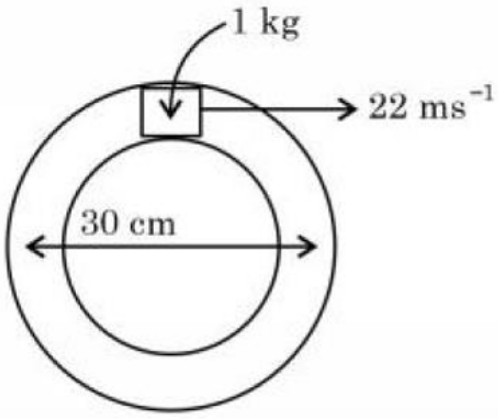
resistance will be _____.

Question 56: The decay constant for a radioactive nuclide is $1.5 \times 10^{-5} s^{-1}$. Atomic weight of the substance is 60 g mole^{-1}. ($N_A = 6 \times 10^{23}$). The activity of 1.0 µg of the substance is _____ $\times 10^{10}$ Bq.

Question 57: Two wires each of radius 0.2 cm and negligible mass, one made of steel and the other made of brass are loaded as shown in the figure. The elongation of the steel wire is _____ $\times 10^{-6}$ m. [Young's modulus for steel = $2 \times 10^{11}\, Nm^{-2}$ and g = $10\, ms^{-2}$]

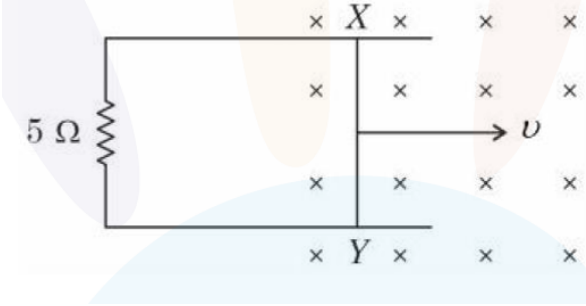


Question 58: A closed circular tube of average radius 15 cm, whose inner walls are rough, is kept in vertical plane. A block of mass 1 kg just fit inside the tube. The speed of block is 22 m/s, when it is introduced at the top of tube. After completing five oscillations, the block stops at the bottom region of tube. The work done by the tube on the block is _____ J. (Given: g = $10\, ms^{-2}$)



Question 59: A 1 m long metal rod XY completes the circuit as shown in figure. The plane of the circuit is perpendicular to the magnetic field of flux density 0.15 T. If the resistance of the

circuit is $5\,\omega$, the force needed to move the rod in direction, as indicated, with a constant speed of 4 m/s will be _____ 10^{-3} N.

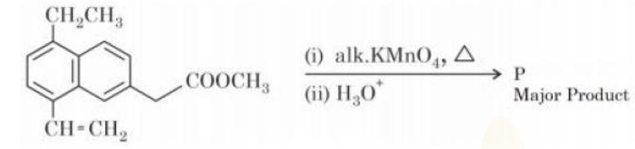


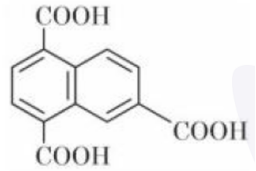
Question 60: The current required to be passed through a solenoid of 15 cm length and 60 turns in order to demagnetize a bar magnet of magnetic intensity $2.4 \times 10^3\ Am^{-1}$ is _____ A.

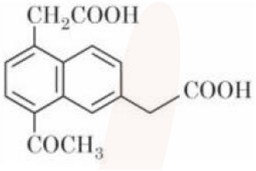
Chemistry

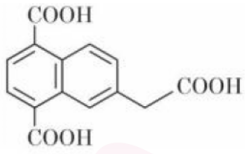
Section A

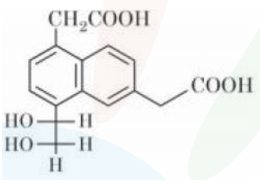
Question 61: The major product 'P' formed in the given reaction is



(1) 

(2) 

(3) 

(4) 

Question 62: Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to

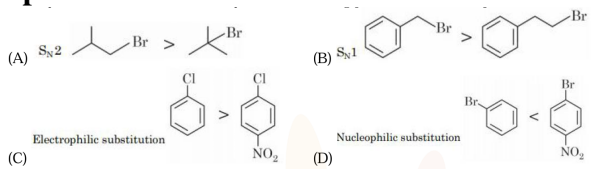
(1) prevent hydrolysis

(2) prevent reduction

(3) prevent breaking

(4) prevent oxidation

Question 63: Identify the correct order of reactivity for the following pairs towards the respective mechanism



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

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

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

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

Question 64: Given

(A) $2CO(g) + O_2(g) \rightarrow 2CO_2(g) \qquad \Delta H_1^\circ = -x\, KJ\, mol^{-1}$

(B) $C(graphite) + O_2(g) \rightarrow CO_2(g) \qquad \Delta H_2^\circ = -y\, KJ\, mol^{-1}$

The ΔH° for the reaction

$C(graphite) + \frac{1}{2}O_2(g) \rightarrow CO(g)$ **is**

(1) $\frac{x-2y}{2}$

(2) $\frac{x+2y}{2}$

(3) $\frac{2x-y}{2}$

(4) $2y - x$

Question 65: Using column chromatography mixture of two compounds 'A' and 'B' was separated. 'A' eluted first, this indicates 'B' has

(1) high R_f, weaker adsorption

(2) high R_f, stronger adsorption

(3) low R_f, stronger adsorption

(4) low R_f, weaker adsorption

Question 66: Lime reacts exothermally with water to give 'A' which has low solubility in water. Aqueous solution of 'A' is often used for the test of CO2. a test in which insoluble B is formed. If B is further reacted with CO2 then soluble compound is formed. 'A' is

(1) Quick lime

(2) Slaked lime

(3) White lime

(4) Lime water

Question 67: Match List I with list II

List I: Industry	**List II: Waste Generated**
(A) Steel plants	(I) Gypsum
(B) Thermal power plants	(II) Fly ash
(C) Fertilizer industries	(III) Slag
(D) Paper mills	(IV) Bio-degradable wastes

Choose the correct answer from the options given below.

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

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

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

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

Question 68: Suitable reaction condition for preparation of Methyl phenyl ether is

(1) Benzene, MeBr

(2) $PhO^{\ominus}Na^{\oplus}$, MeOH

(3) Ph-Br, $MeO^{\ominus}Na^{\oplus}$

(4) $PhO^{\ominus}Na^{\oplus}$, MeBr

Question 69: The one that does not stabilize 2° and 3° structures of proteins is

(1) H-bonding

(2) –S–S– linkage

(3) van der waals forces

(4) –O–O– linkage

Question 70: The compound which does not exist is

(1) $PbEt_4$

(2) BeH_2

(3) NaO_2

(4) $(NH_4)_2BeF_4$

Question 71: Given below are two reactions, involved in the commercial production of dihydrogen (H_2). The two reactions are carried out at temperature "T_1" and "T_2", respectively

$$C(s) + H_2O(g) \xrightarrow{T_1} CO(g) + H_2(g)$$

$$CO(g) + H_2O(g) \xrightarrow[catalyst]{T_2} CO_2(g) + H_2(g)$$

The temperatures T_1 and T_2 are correctly related as

(1) $T_1 = T_2$

(2) $T_1 < T_2$

(3) $T_1 > T_2$

(4) T_1 = 100 K, T_2 = 1270 K

Question 72: The enthalpy change for the adsorption process and micelle formation respectively are

(1) $\Delta H_{ads} < 0$ and $\Delta H_{mic} < 0$

(2) $\Delta H_{ads} > 0$ and $\Delta H_{mic} < 0$

(3) $\Delta H_{ads} < 0$ and $\Delta H_{mic} > 0$

(4) $\Delta H_{ads} > 0$ and $\Delta H_{mic} > 0$

Question 73: The pair from the following pairs having both compounds with net non-zero dipole moment is

(1) cis-butene, trans-butene

(2) Benzene, anisidine

(3) CH_2Cl_2, $CHCl_3$

(4) 1,4-Dichlorobenzene, 1,3-Dichlorobenzene

Question 74: Which of the following is used as a stabilizer during the concentration of sulphide ores?

(1) Xanthates

(2) Fatty acids

(3) Pine oils

(4) Cresols

Question 75: Which of the following statements are correct?

(A) The M^{3+}/M^{2+} reduction potential for iron is greater than manganese

(B) The higher oxidation states of first row d-block elements get stabilized by oxide ion.

(C) Aqueous solution of Cr^{2+} can liberate hydrogen from dilute acid.

(D) Magnetic moment of V^{2+} is observed between 4.4-5.2 BM.

Choose the correct answer from the options given below:

(1) (C), (D) only

(B) (B), (C) only

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

(D) (A), (B) only

Question 76: Given below are two statements:

Statement I: Aqueous solution of $K_2Cr_2O_7$ is preferred as a primary standard in volumetric analysis over $Na_2Cr_2O_7$ aqueous solution.

Statement II: $K_2Cr_2O_7$ has a higher solubility in water than $Na_2Cr_2O_7$.

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

(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

Question 77: The octahedral diamagnetic low spin complex among the following is

(1) $[CoF_6]^{3-}$

(2) $[CoCl_6]^{3-}$

(3) $[Co(NH_3)_6]^{3+}$

(4) $[NiCl_4]^{2-}$

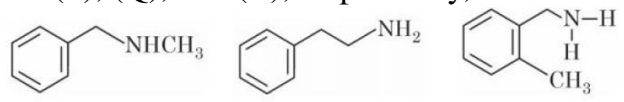
Question 78: Isomeric amines with molecular formula $C_8H_{11}N$ given the following tests:

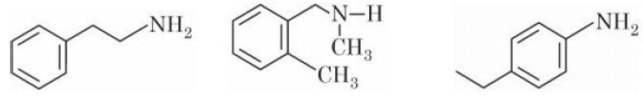
Isomer (P): Can be prepared by Gabriel phthalimide synthesis.

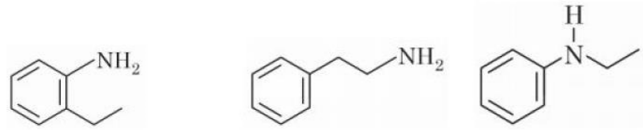
Isomer (Q): Reacts with Hinsberg's reagent to give a solid insoluble in NaOH.

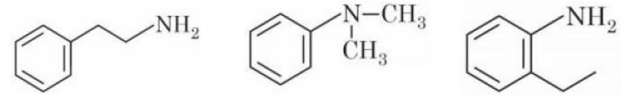
Isomer (R): Reacts with HONO followed by β-naphthol in NaOH to give a red dye.

Isomer (P), (Q), and (R), respectively, are:

(1) 

(2) 

(3) 

(4) 

Question 79: The number of molecules and moles in 2.8375 litres of O_2 at STP are respectively

(1) 7.527×10^{22} and 0.125 mol

(2) 1.505×10^{23} and 0.250 mol

(3) 7.527×10^{23} and 0.125 mol

(4) 7.527×10^{22} and 0.250 mol

Question 80: Match List I with List II

List I	Polymer	List II
(A)	Nylon-2-Nylon-6	(I) Thermosetting polymer
(B)	Buna-N	(II) Biodegradable polymer
(C)	Urea-Formaldehyde resin	(III) Synthetic rubber
(D)	Dacron	(IV) Polyester

Choose the correct answer from the options given below:

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

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

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

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

Section B

Question 81: If the degree of dissociation of an aqueous solution of weak monobasic acid is determined to be 0.3, then the observed freezing point will be _____ % higher than the expected/theoretical freezing point. (Nearest integer)

Question 82: In the following reactions, the total number of oxygen atoms in X and Y is _____

$$Na_2O + H_2O \rightarrow 2X$$

$$Cl_2O_7 + H_2O \rightarrow 2Y$$

Question 83: The sum of lone pairs present on the central atom of the interhalogens IF_5 and IF_7 is _____

Question 84: The number of bent-shaped molecule(s) from the following is _____

$$N_3^-, NO_2^-, I_3^-, O_3, SO_2$$

Question 85: The number of correct statement(s) involving equilibria in physical from the following is _____

(1) Equilibrium is possible only in a closed system at a given temperature.

(2) Both the opposing processes occur at the same rate.

(3) When equilibrium is attained at a given temperature, the value of all its parameters.

(4) For dissolution of solids in liquids, the solubility is constant at a given temperature.

Question 86: At constant temperature, a gas is at a pressure of 940.3 mm Hg. The pressure at which its volume decreases by 40% is _____ mm Hg. (Nearest integer)

Question 87: $\mathbf{FeO_4^{2-} \xrightarrow{+2.2\,V} Fe^{3+} \xrightarrow{+0.70\,V} Fe^{2+} \xrightarrow{-0.45\,V} Fe^{\circ}}$

$E^{\circ}_{\mathbf{FeO_4^{2-}/Fe^{2+}}}$ **is** $x \times 10^{-3}$ **V. The value of** x **is** _____

Question 88: A molecule undergoes two independent first-order reactions whose respective half-lives are 12 min and 3 min. If both the reactions are occurring, then the time taken for the 50% consumption of the reactant is _____ min. (Nearest integer)

Question 89: The number of incorrect statement(s) about the black body from the following is _____

(1) Emit or absorb energy in the form of electromagnetic radiation.

(2) Frequency distribution of the emitted radiation depends on temperature.

(3) At a given temperature, intensity vs frequency curve passes through a maximum value.

(4) The maximum of the intensity vs frequency curve is at a higher frequency at higher temperature compared to that at lower temperature.

Question 90: In potassium ferrocyanide, there are _____ pairs of electrons in the t_{2g} **set of orbitals.**
