Q1 - 25 July - Shift 1

If the maximum value of the term independent of t in the expansion of $\left(t^2x^{\frac{1}{5}}+\frac{(1-x)^{\frac{1}{10}}}{t}\right)^{15}$, $x \geq 0$, is K, then 8K is equal to _____.

Space for your notes:

Q2 - 25 July - Shift 2

The remainder when $(11)^{1011} + (1011)^{11}$ is divided by 9 is

(A) 1 (B) 4

(C) 6 (D) 8

Space for your notes:

Q3 - 26 July - Shift 1

If the coefficients of x and x^2 in the expansion of $(1 + x)^p(1 - x)^q$, $p, q \leq 15$, are –3 and–5 respectively, then the coefficient of x^3 is equal to_____.

Space for your notes:

Q4 - 26 July - Shift 2

$\sum_{\substack{i,j=0 \\ i\neq j}}^{n} {}^nC_i \, {}^nC_j$ is equal to

(A) $2^{2n} - {}^{2n}C_n$ (B) $2^{2n-1} - {}^{2n-1}C_{n-1}$

(C) $2^{2n} - \frac{1}{2}\,{}^{2n}C_n$ (D) $2^{n-1} + {}^{2n-1}C_n$

Space for your notes:

Q5 - 27 July - Shift 1

The remainder when $(2021)^{2022} + (2022)^{2021}$ is divided by 7 is

(A) 0 (B) 1

(C) 2 (D) 6

Space for your notes:

Q6 - 27 July - Shift 2

Let for the 9^{th} term in the binomial expansion of $(3 + 6x)^n$, in the increasing powers of 6x, to be the greatest for $x = \frac{3}{2}$, the least value of n is n_0. If k is the ratio of the coefficient of x^6 to the coefficient of x^3, then $k + n_0$ is equal to:

Space for your notes:

Q7 - 28 July - Shift 1

The remainder when $7^{2022} + 3^{2022}$ is divided by 5 is:

(A) 0 (B) 2 (C) 3 (D) 4

Space for your notes:

Q8 - 28 July - Shift 2

Let the coefficients of the middle terms in the expansion of $\left(\frac{1}{\sqrt{6}} + \beta x\right)^4$, $(1 - 3\beta x)^2$ and $\left(1 - \frac{\beta}{2}x\right)^6$, $\beta > 0$, respectively form the first three terms of an A.P. If d is the common difference of this A.P., then $50 - \frac{2d}{\beta^2}$ is equal to _____

Space for your notes:

Q9 - 28 July - Shift 2

If $1+(2+{}^{49}C_1+{}^{49}C_2+\ldots..+{}^{49}C_{49})({}^{50}C_2+{}^{50}C_4+\ldots..+{}^{50}C_{50})$ is equal to $2^n.m$, where m is odd, then n + m is equal to _____

Space for your notes:

Q10 - 29 July - Shift 1

Let the ratio of the fifth term from the beginning to the fifth term from the end in the binomial expansion of $\left(\sqrt[4]{2}+\frac{1}{\sqrt[4]{3}}\right)^n$, in the increasing powers of $\frac{1}{\sqrt[4]{3}}$ be $\sqrt[4]{6}$: 1. If the sixth term from the beginning is $\frac{\alpha}{\sqrt[4]{3}}$, then α is equal to _____.

Space for your notes:

Q11 - 29 July - Shift 2

If $\sum_{k=1}^{10} K^2\left(10_{C_K}\right)^2 = 22000L$, then L is equal to ___.

Space for your notes:

Q1 - 24 June - Shift 1

The remainder when 3^{2022} is divided by 5 is

(A) 1 (B) 2

(C) 3 (D) 4

Space for your notes:

Q2 - 24 June - Shift 2

The remainder on dividing $1 + 3 + 3^2 + 3^3 + ... + 3^{2021}$ by 50 is _____.

Space for your notes:

Q3 - 25 June - Shift 1

Let C_r denote the binomial coefficient of x^r in the expansion of $(1 + x)^{10}$. If $\alpha, \beta \in R$. $C_1 + 3 \cdot 2C_2 + 5 \cdot 3C_3 + ...$ upto 10 terms

$$= \frac{\alpha \times 2^{11}}{2^{\beta} - 1}\left(C_0 + \frac{C_1}{2} + \frac{C_2}{3} + ...\text{upto 10 terms}\right)$$

then the value of $\alpha + \beta$ is equal to

Space for your notes:

Q4 - 25 June - Shift 2

The coefficient of x^{101} in the expression

$$(5+x)^{500} + x(5+x)^{499} + x^2(5+x)^{498} + ...x^{500},$$

$x > 0$, is

(A) ${}^{501}C_{101}(5)^{399}$ (B) ${}^{501}C_{101}(5)^{400}$

(C) ${}^{501}C_{100}(5)^{400}$ (D) ${}^{500}C_{101}(5)^{399}$

Space for your notes:

Q5 - 25 June - Shift 2

If the sum of the coefficients of all the positive even powers of x in the binomial expansion of $\left(2x^3+\frac{3}{x}\right)^{10}$ is $5^{10}-\beta\cdot 3^9$, then β is equal to _____

Space for your notes:

Q6 - 26 June - Shift 1

The remainder when $(2021)^{2023}$ is divided by 7 is :

(A) 1 (B) 2 (C) 5 (D) 6

Space for your notes:

Q7 - 26 June - Shift 2

If $\left({}^{40}C_0\right)+\left({}^{41}C_1\right)+\left({}^{42}C_2\right)+\ldots+\left({}^{60}C_{20}\right)=\frac{m}{n}\,{}^{60}C_{20}$, m and n are coprime, then m + n is equal to ____ .

Space for your notes:

Q8 - 27 June - Shift 1

If the coefficient of x^{10} in the binomial expansion of $\left(\frac{\sqrt{x}}{5^{\frac{1}{4}}}+\frac{\sqrt{5}}{x^{\frac{1}{3}}}\right)^{60}$ is $5^k l$, where l, $k \in N$ and l is co-prime to 5, then k is equal to _____.

Space for your notes:

Q9 - 27 June - Shift 2

If the sum of the coefficients of all the positive powers of x, in the binomial expansion of $\left(x^n+\frac{2}{x^5}\right)^7$ is 939, then the sum of all the possible integral values of n is :

Space for your notes:

Q10 - 28 June - Shift 1

If

$$\sum_{k=1}^{31}\left({}^{31}C_k\right)\left({}^{31}C_{k-1}\right)-\sum_{k=1}^{30}\left({}^{30}C_k\right)\left({}^{30}C_{k-1}\right)=\frac{\alpha(60!)}{(30!)(31!)},$$

Where $\alpha \in R$, then the value of 16α is equal to

(A) 1411 (B) 1320

(C) 1615 (D) 1855

Space for your notes:

Q11 - 28 June - Shift 1

The number of positive integers k such that the constant term in the binomial expansion of $\left(2x^3+\frac{3}{x^k}\right)^{12}, x \neq 0$ is $2^8 \cdot \ell$, where ℓ is an odd integer, is _____.

Space for your notes:

Q12 - 28 June - Shift 2

The term independent of x in the expression of $\left(1-x^2+3x^3\right)\left(\frac{5}{2}x^3-\frac{1}{5x^2}\right)^{11}, x \neq 0$ is

(A) $\frac{7}{40}$ (B) $\frac{33}{200}$

(C) $\frac{39}{200}$ (D) $\frac{11}{50}$

Space for your notes:

Q13 - 29 June - Shift 1

If the constant term in the expansion of $\left(3x^3 - 2x^2 + \frac{5}{x^5}\right)^{10}$ is $2^k \cdot l$, where l is an odd integer, then the value of k is equal to :

(A) 6 (B) 7

(C) 8 (D) 9

Space for your notes:

Q14 - 29 June - Shift 2

Let $n \geq 5$ be an integer. If $9^n - 8n - 1 = 64\ \alpha$ and $6^n - 5n - 1 = 25\ \beta$, then $\alpha - \beta$ is equal to:

(A) $1 + {}^nC_2\,(8-5) + {}^nC_3\,(8^2 - 5^2) + \ldots + {}^nC_n\,(8^{n-1} - 5^{n-1})$

(B) $1 + {}^nC_3\,(8-5) + {}^nC_4\,(8^2 - 5^2) + \ldots + {}^nC_n\,(8^{n-2} - 5^{n-2})$

(C) ${}^nC_3\,(8-5) + {}^nC_4\,(8^2 - 5^2) + \ldots + {}^nC_n\,(8^{n-2} - 5^{n-2})$

(D) ${}^nC_4\,(8-5) + {}^nC_5\,(8^2 - 5^2) + \ldots + {}^nC_n\,(8^{n-3} - 5^{n-3})$

Space for your notes:

Q15 - 29 June - Shift 2

Let the coefficients of x^{-1} and x^{-3} in the expansion of $\left(2x^{\frac{1}{5}} - \frac{1}{x^{\frac{1}{5}}}\right)^{15}$, $x > 0$, be m and n respectively. If r is a positive integer such $mn^2 = {}^{15}C_r \cdot 2^r$, then the value of r is equal to__.

Space for your notes:

Q1 - 24 June - Shift 2

The correct order of bound orders of C_2^{2-}, N_2^{2-} and O_2^{2-} is, respectively.

(A) $C_2^{2-} < N_2^{2-} < O_2^{2-}$ (B) $O_2^{2-} < N_2^{2-} < C_2^{2-}$

(C) $C_2^{2-} < O_2^{2-} < N_2^{2-}$ (D) $N_2^{2-} < C_2^{2-} < O_2^{2-}$

Space for your notes:

Q2 - 25 June - Shift 1

Bonding in which of the following diatomic molecule(s) become(s) stronger, on the basis of MO Theory, by removal of an electron ?

(A) NO (B) N_2

(C) O_2 (D) C_2

(E) B_2

Space for your notes:

Q3 - 25 June - Shift 2

Amongst BeF_2, BF_3, H_2O, NH_3, CCl_4 and HCl, the number of molecules with non-zero net dipole moment is _____.

Space for your notes:

Q4 - 26 June - Shift 1

Consider the ions/molecule

O_2^+, O_2, O_2^-, O_2^{2-}

For increasing bond order the correct option is :

(A) $O_2^{2-} < O_2^- < O_2 < O_2^+$

(B) $O_2^- < O_2^{2-} < O_2 < O_2^+$

(C) $O_2^- < O_2^{2-} < O_2^+ < O_2$

(D) $O_2^- < O_2^+ < O_2^{2-} < O_2$

Space for your notes:

Q5 - 26 June - Shift 2

The oxide which contains an odd electron at the nitrogen atom is

(1) N_2O (2) NO_2 (3) N_2O_3 (4) N_2O_5

Space for your notes:

Q6 - 26 June - Shift 2

Amongst SF_4, XeF_4, CF_4 and H_2O, the number of species with two lone pairs of electrons _____.

Space for your notes:

Q7 - 27 June - Shift 1

Based upon VSEPR theory, match the shape (geometry) of the molecules in List-I with the molecules in List-II and select the most appropriate option

Space for your notes:

List-I (Shape)	**List-II (Molecules)**
(A) T-shaped	(I) XeF_4
(B) Trigonal planar	(II) SF_4
(C) Square planar	(III) ClF_3
(D) See-saw	(IV) BF_3

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

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

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

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

Q8 - 27 June - Shift 2

Identify the **incorrect** statement for PCl_5 from the following.

Space for your notes:

(A) In this molecule, orbitals of phosphorous are assumed to undergo sp^3d hybridization.

(B) The geometry of PCl_5 is trigonal bipyramidal.

(C) PCl_5 has two axial bonds stronger than three equatorial bonds.

(D) The three equatorial bonds of PCl_5 lie in a plane.

Q9 - 27 June - Shift 2

The correct order of increasing intermolecular hydrogen bond strength is

(A) $HCN < H_2O < NH_3$

(B) $HCN < CH_4 < NH_3$

(C) $CH_4 < HCN < NH_3$

(D) $CH_4 < NH_3 < HCN$

Space for your notes:

Q10 - 28 June - Shift 1

The hybridization of P exhibited in PF_5 is sp^xd^y. The value of y is _____.

Space for your notes:

Q11 - 28 June - Shift 2

In the structure of SF_4, the lone pair of electrons on S is in.

(A) equatorial position and there are two lone pair-bond pair repulsions at 90°

(B) equatorial position and there are three lone pair-bond pair repulsions at 90°

(C) axial position and there are three lone pair – bond pair repulsion at 90°.

(D) axial position and there are two lone pair – bond pair repulsion at 90°.

Space for your notes:

Q12 - 29 June - Shift 1

Arrange the following in the decreasing order of their covalent character :

(A) LiCl

(B) NaCl

(C) KCl

(D) CsCl

Question: Choose the **most appropriate** answer from the options given below :

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

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

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

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

Space for your notes:

Q13 - 29 June - Shift 2

Consider the species CH_4, NH_4^+ and BH_4^-. Choose the correct option with respect to the there species:

(A) They are isoelectronic and only two have tetrahedral structures

(B) They are isoelectronic and all have tetrahedral structures

(C) Only two are isoelectronic and all have tetrahedral structures

(D) Only two are isoelectronic and only two have tetrahedral structures

Space for your notes:

Q14 - 29 June - Shift 2

Number of lone pair (s) of electrons on central atom and the shape of BrF_3 molecule respectively, are :

(A) 0, triangular planar.

(B) 1, pyramidal.

(C) 2, bent T-shape.

(D) 1, bent T-shape

Space for your notes:

Q1 - 25 July - Shift 1

Among the following species

$N_2, N_2^+, N_2^-, N_2^{2-}, O_2, O_2^+, O_2^-, O_2^{2-}$

the number of species showing diamagnetism is

Space for your notes:

Q2 - 25 July - Shift 2

Match **List I** with **List II** :

List-I (molecule)	**List-II (hybridization; shape)**
A. XeO_3	I. sp^3d ; linear
B. XeF_2	II. sp^3; pyramidal
C. $XeOF_4$	III. sp^3d^3; distorted octahedral
D. XeF_6	IV. sp^3d^2 ;square pyramidal

Choose the correct answer from the options given below:

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

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

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

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

Space for your notes:

Q3 - 25 July - Shift 2

The total number of acidic oxides from the following list is: NO, N_2O, B_2O_3, N_2O_5, CO, SO_3, P_4O_{10}

(A) 3 (B) 4

(C) 5 (D) 6

Space for your notes:

Q4 - 25 July - Shift 2

The sum of number of lone pairs of electrons present on the central atoms of XeO_3, $XeOF_4$ and XeF_6 is _____

Space for your notes:

Q5 - 26 July - Shift 1

Match **List - I** with **List - II**.

List - I (Compound)	**List – II (Shape)**
(A) BrF_5	(I) bent
(B) $[CrF_6]^{3-}$	(II) square pyramidal
(C) O_3	(III) trigonal bipyramidal
(D) PCl_5	(IV) octahedral

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

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

Space for your notes:

Q6 - 26 July - Shift 2

Arrange the following in increasing order of their covalent character.

(A) CaF_2 (B) $CaCl_2$
(C) $CaBr_2$ (D) CaI_2

Choose the correct answer from the options given below.

(A) B < A < C < D (B) A < B < C < D
(C) A < B < D < C (D) A < C < B < D

Space for your notes:

Q7 - 27 July - Shift 1

Given below are two statements.

Statement I : O_2 , Cu^{2+} and Fe^{3+} are weakly attracted by magnetic field and are magnetized in the same direction as magnetic field.

Statement II : NaCl and H_2O are weakly magnetized in opposite direction to magnetic field.

In the light of the above statements, choose the ***most appropriate*** answer form the options given below :

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

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

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

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

Space for your notes:

Q8 - 27 July - Shift 1

Amongst the following the number of oxide(s) which are paramagnetic in nature is

Na_2O, KO_2, NO_2, N_2O, ClO_2, NO, SO_2, Cl_2O

Space for your notes:

Q9 - 27 July - Shift 1

According to MO theory, number of species/ions from the following having identical bond order is_____:

$CN^-, NO^+, O_2, O_2^+, O_2^{2+}$

Space for your notes:

Q10 - 27 July - Shift 2

Match List-I with List-II

List-I	List-II
(A) $\Psi_{MO} = \Psi_A - \Psi_B$	(I) Dipole moment
(B) $\mu = Q \times r$	(II) Bonding molecular orbital
(C) $\frac{N_b - N_a}{2}$	(III) Anti-bonding molecualr orbital
(D) $\Psi_{MO} = \Psi_A + \Psi_B$	(IV) Bond order

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

Space for your notes:

Q11 - 27 July - Shift 2

The number of molecule(s) or ion(s) from the following having non-planar structure is_____.

$NO_3^-, H_2O_2, BF_3, PCl_3, XeF_4,$
$SF_4, XeO_3, PH_4^+, SO_3, [Al(OH)_4]^-$

Space for your notes:

Q12 - 28 July - Shift 1

The number of paramagnetic species among the following is _____.

B_2, Li_2, C_2, C_2^-, O_2^{2-}, O_2^+ and He_2^+

Space for your notes:

Q13 - 28 July - Shift 2

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

Assertion A : Zero orbital overlap is an out of phase overlap.

Reason : It results due to different orientation/ direction of approach of orbitals.

In the light of the 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) Both A and R are true but R is NOT the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

Space for your notes:

Q14 - 29 July - Shift 1

Number of lone pairs of electrons in the central atom of SCl_2, O_3, ClF_3 and SF_6, respectively, are :

(A) 0, 1, 2 and 2

(B) 2, 1, 2 and 0

(C) 1, 2, 2 and 0

(D) 2, 1, 2 and 0

Space for your notes:

Q15 - 29 July - Shift 2

Consider, PF_5, BrF_5, PCl_3, SF_6, $[ICl_4]^-$, ClF_3 and IF_5.

Amongst the above molecule(s)/ion(s), the number of molecule(s)/ion(s) having sp^3d^2 hybridisation is____.

Space for your notes: