FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
FULL TEST – V
PAPER –1
TEST DATE: 18-02-2025

Time Allotted: 3 Hours **Maximum Marks: 180**

General Instructions:

- The test consists of total 51 questions.
- Each subject (PCM) has 17 questions.
- This question paper contains **Three Parts.**
- **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
- Each **Part** is further divided into **Two Sections**: **Section-A & Section-B**.

Section – A *(01 – 04, 18 – 21, 35 – 38)*: This section contains **TWELVE (12)** questions. Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.

Section – A *(05 –07, 22 – 24, 39 – 41):* This section contains **NINE (9)** questions. Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

Section – A *(08 – 11, 25 – 28, 42 – 45):* This section contains **TWELVE (12)** Matching List Type Questions. Each question has **FOUR** statements in **List-I** entries (P), (Q), (R) and (S) and **FIVE** statements in **List-II** entries (1), (2), (3), (4) and (5). The codes for lists have choices (A), (B), (C), (D) out of which, **ONLY ONE** of these four options is correct answer.

Section – B *(12 – 17, 29 – 34, 46 – 51):* This section contains **EIGHTEEN (18)** numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.

MARKING SCHEME

Section – A (Single Correct): Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+3	If ONLY the correct option is chosen.
Zero Marks	:	0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	:	–1	In all other cases.

Section – A (One or More than One Correct): Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4	If only (all) the correct option(s) is (are) chosen;
Partial Marks	:	+3	If all the four options are correct but ONLY three options are chosen;
Partial marks	:	+2	If three or more options are correct but ONLY two options are chosen and both of which are correct;
Partial Marks	:	+1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	:	0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	:	–2	In all other cases.

Section – B: Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4	If ONLY the correct numerical value is entered at the designated place;
Zero Marks	:	0	In all other cases.

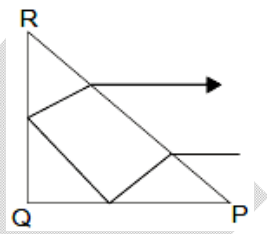
Physics

PART – I

SECTION – A
(One Options Correct Type)

*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

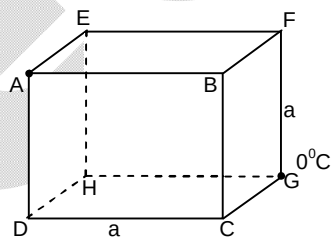
1. A ray of light incident parallel to the base PQ of an isosceles right-angled triangular prism PQR suffers two successive total internal reflections at the faces PQ and QR before emerging reversed in direction as shown. If the refractive index of the material of the prism is μ, then



(A) $\mu > \sqrt{5}$ (B) $\sqrt{3} < \mu < \sqrt{5}$

(C) $\sqrt{2} < \mu < \sqrt{3}$ (D) $\mu < \sqrt{2}$

2. A cubical frame is made by connecting 12 identical uniform conducting rods as shown in the figure. In the steady state the temperature of junction A is 100^0 C while that the G is 0^0C. Then,



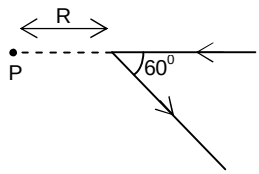
(A) B will be Hotter than H

(B) Temperature of F is 40^0C

(C) Temperature of D is 66.67^0C

(D) Temperature of E is 50^0C

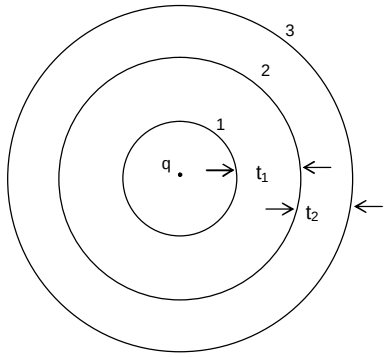
3. A long straight wire, carrying a current I is bent at its mid point to form an angle of 60^0. AT a point P, distance R from the point of bending the magnetic field is



(A) $\dfrac{\left(\sqrt{2}-1\right)\mu_0 i}{4\pi R}$ (B) $\dfrac{\left(\sqrt{2}+1\right)\mu_0 i}{4\pi R}$

(C) $\dfrac{\mu_0 i}{4\sqrt{3}\pi R}$ (D) $\dfrac{\mu_0 i}{8R}$

4. Figure show three spherical equipotential surface 1, 2 and 3 round a point charge q. The potential difference $V_1 - V_2 = V_2 - V_3$. If t_1 and t_2 be the distance between them. Them



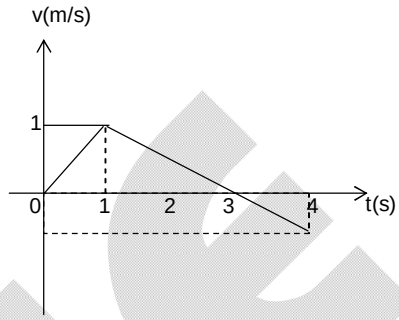
(A) $t_1 = t_2$ (B) $t_1 > t_2$

(C) $t_1 < t_2$ (D) $t_1 \le t_2$

SECTION – A
(One or More than one correct type)

*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

5. The velocity time graph of a particle is shown for time interval t = 0 to t = 4 sec. Choose correct options.



(A) the displacement of the particle is equal to $\frac{5}{4}$m

(B) the distance covered by the particle is equal to $\frac{7}{4}$m

(C) the average velocity of the particle is $\frac{1}{2}$m/s over 4s

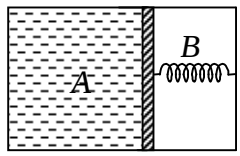
(D) the motion is uniformly accelerated for 4s

6. An electron in H-atom jumps from second excited state to first excited state and then from first excited to ground state. Let the ratio of wavelength, momentum and energy of photons emitted in these two cases be *a, b* and *c* respectively. Then

(A) $c = \frac{1}{a}$ (B) $a = \frac{9}{4}$

(C) $b = \frac{5}{27}$ (D) $c = \frac{5}{27}$

7. A thermally insulated chamber of volume $2V_0$ is divided by a frictionless piston of area *S* into two equal parts *A* and *B*. Part *A* has an ideal gas at pressure P_0 and temperature T_0 and in part *B* is vacuum. A massless spring of force constant *k* is connected with piston and the wall of the container as shown. Initially spring is unstretched. Gas in chamber *A* is allowed to expand. Let in equilibrium spring is compressed by x_0. Then



(A) final pressure of the gas is $\frac{kx_0}{S}$.

(B) work done by the gas is $\frac{1}{2}kx_0^2$.

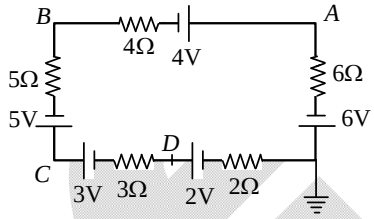
(C) change in internal energy of the gas is $\frac{1}{2}kx_0^2$.

(D) temperature of the gas is decreased.

SECTION – A
(Matching List Type)

*This section contains **FOUR (04)** Matching List Type Questions. Each question has FOUR statements in **List-I** entries (P), (Q), (R) and (S) and FIVE statements in **List-II** entries (1), (2), (3), (4) and (5). The codes for lists have choices (A), (B), (C), (D) out of which **ONLY ONE** of these four options is correct answer.*

8. Five batteries whose emf and internal resistance are as shown in figure. Match the following



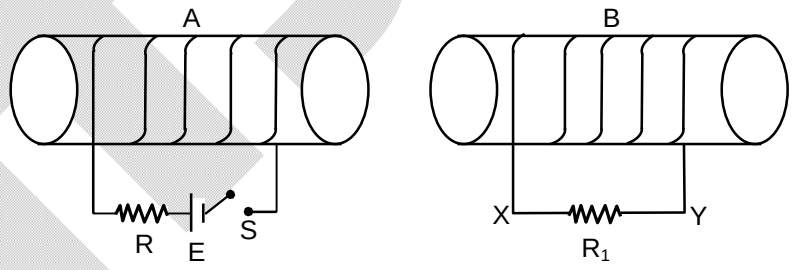
List–I		List–II	
(P)	Potential of point *A*	(1)	– 5V
(Q)	Potential of point *B*	(2)	1 V
(R)	Potential of point *C*	(3)	– 3V
(S)	Potential of point *D*	(4)	2.5V
		(5)	1.5 V

The correct option is:

(A) P → 3 ; Q → 4 ; R → 3 ; S → 1 (B) P → 2 ; Q → 4 ; R → 1 ; S → 3

(C) P → 3 ; Q → 1 ; R → 4 ; S → 2 (D) P → 2 ; Q → 3 ; R → 2 ; S → 4

9. In the circuit shown in figure two coils are arranged as shown. In List-I, some operation which is carried out in circuit I is mentioned and in List-II.



about its effect. Match the entries of List-I with the entries of List-II.

List–I		List–II	
(P)	Switch S is closed (exclude small switching time)	(1)	Current in R_1 is form X to Y.
(Q)	Switch S is closed for long time then it opened for this transition time.	(2)	Current in R_1 is form Y to X
(R)	If coil A is move, perpendicular to B, switch S is closed.	(3)	No current is flowing through R_1.
(S)	The battery of constant emf is replaced by a varying emf and switch S is closed.	(4)	Current in R_1 can be from X to Y or form Y to X.
		(5)	Coil B will attract coil A

The correct option is:

(A) P → 2 ; Q → 1,3 ; R → 5 ; S → 4 (B) P → 3 ; Q → 2 ; R → 2,5 ; S → 3,4

(C) P → 3 ; Q → 4 ; R → 1,2 ; S → 4 (D) P → 1 ; Q → 2,5 ; R → 2,5 ; S → 4

10. Velocity of sound in air is V and the length of organ pipe is L. P_o is the mean pressure and ΔP_0 is amplitude of pressure variations.

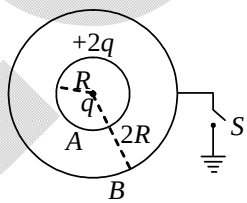
List – I		List – II	
(P)	If the pipe is closed at one end, the frequency of first overtone is	(1)	3V/4L
(Q)	If the pipe is open at both ends the frequency of fourth harmonic is	(2)	2V/L
(R)	If the pipe is closed at one end the pressure at open end is	(3)	0
(S)	The pressure at closed end is	(4)	$[P_o - \Delta P_o, \quad P_o + \Delta P_o]$
		(5)	P_o

The correct option is:

(A) P → 1 ; Q → 2 ; R → 4 ; S → 5 (B) P → 1 ; Q → 2 ; R → 5 ; S → 4

(C) P → 1 ; Q → 3 ; R → 4 ; S → 5 (D) P → 2 ; Q → 1 ; R → 5 ; S → 4

11. Two concentric conducting shells *A* and *B* have radii *R* and 2*R*. A charge *q* is placed at the centre of the shells and a charge 2*q* is given to shell *A*.



List-I		List-II	
(P)	Charge on inner surface of shell *A*	(1)	–3*q*
(Q)	Charge on inner surface of shell *B*	(2)	Zero
(R)	Charge on outer surface of shell *A*	(3)	–*q*
(S)	Charge on outer surface of shell *B*	(4)	3*q*
		(5)	2*q*
		(6)	–2*q*

When switch is open:

(A) P → 3 ; Q → 1 ; R → 4 ; S → 4 (B) P → 5 ; Q → 1 ; R → 4 ; S → 2

(C) P → 1 ; Q → 3 ; R → 4 ; S → 5 (D) P → 4 ; Q → 3 ; R → 5 ; S → 6

SECTION – B

(Numerical Answer Type)

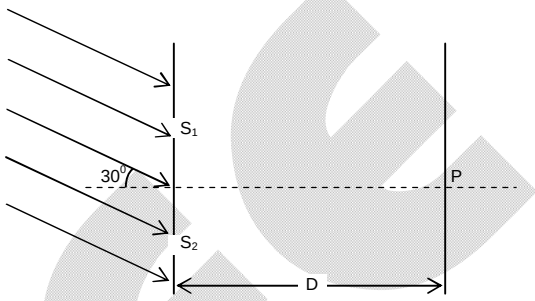
*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

12. A 20 cm long string, having a mass of 1.0 g, is fixed at both the ends. The tension in the string is 0.5 N. The string is set into vibrations using an external vibrator of frequency 100 Hz. Find the separation (in cm) between the successive nodes on the string.

13. Potential energy of a particle moving along x-axis is given by $U = \frac{x^3}{3} - \frac{9x^2}{2} + 20x$. Find out 'x' for position of stable equilibrium state.

14. A bob of mass m, suspended by a string of length l_1, is given a minimum velocity required to complete a full circle in the vertical plane. At the highest point, it colloids elastically with another bob of mass m suspended by a string of length l_2, which is initially at rest. Both the strings are mass-less and inextensible. If the second bob, after collision acquires the minimum speed required to complete a full circle in the vertical plane, the ratio $\frac{l_1}{l_2}$ is

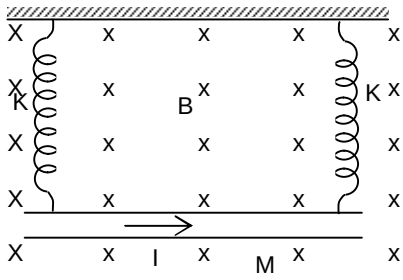
15. The given figure shows a YDSE apparatus are incident on slits S_1 and S_2 ($S_1S_2 = \frac{2}{3}$mm) at an angle 30^o with the horizontal. The medium on left side of the slits in water$\left(\mu_w = 4/3\right)$.



To obtain the central maxima at point P, a glass slab $\left(\mu_g = 3/2\right)$ is introduced in front of slits S_1. If the thickness of the glass slab required for this purpose is t then find the value of 9t (in mm).

16. An ideal gas is expanding such that PT^2 = constant. The coefficient of volume expansion of the gas is A/T where T is temperature in kelvin. Find the value of A.

17. A metal rod of mass 10gm and length 25 cm is suspended on two springs as shown in figure. The springs are extended by 4 cm. When a 20 ampere current passes through the rod it rises by 1 cm. The magnetic field is x × 10^{-2} T (g = 10 m/s^2). Find the value of 2x.



Chemistry

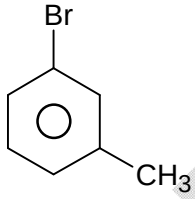
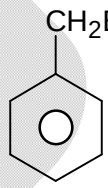
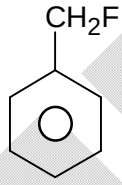
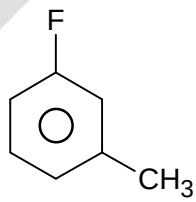
PART – II

SECTION – A
(One Options Correct Type)

*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

18. The incorrect statement for I_3^- ion is:
(A) The central iodine atom undergoes sp^3d hybridization
(B) It is a linear ion.
(C) The central atom contains no lone pair.
(D) The electron in the hybridized d-orbital, forms sigma bond.

19. $CH_3COOH(aq) \rightleftharpoons H^+(aq) + CH_3COO^-(aq)$
Which of the following characteristic of the above system increases by increasing temperature?
(A) K_a (B) p^{K_a}
(C) pH (D) K_b of CH_3COO^-

20. Which of the following compound is most reactive towards OH^- ion through S_N1 path?
(A) 
(B) 
(C) 
(D) 

21. $CH_3CH_2NH_2 + CHCl_3 \xrightarrow{KOH} Product$
The organic product of above reaction is:
(A) CH_3CH_2CN (B) CH_3CH_2NC
(C) CH_3CH_2Cl (D) $CH_3CH_2CH_3$

SECTION – A
(One or More than one correct type)

*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

22. $H_2O_2 + H^+ + I^- \longrightarrow I_2 + H_2O$

On investigation of the above reaction, the following results were obtained.

Initial conc. of reactant in M			Initial rate of formation of I_2 in mol dm^{-3} s^{-1}
$[H_2O_2]$	$[I^-]$	$[H^+]$	
0.01	0.01	0.30	2×10^{-6}
0.03	0.01	0.30	6×10^{-6}
0.03	0.02	0.10	1.2×10^{-5}
0.03	0.02	0.20	1.2×10^{-5}

Choose the correct statement(s)

(A) The rate equation for the reaction is Rate = $k[H_2O_2][I^-]$.

(B) The reaction is zero order with respect to acid.

(C) The reaction is termolecular.

(D) The rate constant is 2×10^{-1} mol^{-2} dm^6 s^{-1}.

23. Which of the following ion(s) maintain an identical d-orbital configuration while forming octahedral complexes with strong field as well as weak field ligands according to crystal field theory?

(A) Fe^{2+} (B) Co^{2+}

(C) Ni^{2+} (D) Zn^{2+}

24. Choose correct statement(s) about the following compound.

$CH_3 - CH = CH - CH = CH - CH_3$

(A) It shows three geometrical isomers

(B) It shows four geometrical isomers

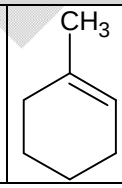
(C) It forms a dicarboxylic acid on acidified permanganate oxidation

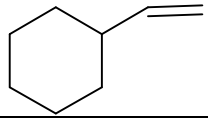
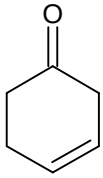
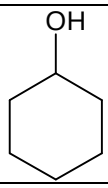
(D) It forms two moles of CH_3COOH on acidified $KMnO_4$ oxidation

SECTION – A
(Matching List Type)

*This section contains **FOUR (04)** Matching List Type Questions. Each question has FOUR statements in **List-I** entries (P), (Q), (R) and (S) and FIVE statements in **List-II** entries (1), (2), (3), (4) and (5). The codes for lists have choices (A), (B), (C), (D) out of which **ONLY ONE** of these four options is correct answer.*

25. Match the lists.

List – I (Reactants)		**List– II (Reagents which convert the reactants of list-I into optically active product)**	
(P)		(1)	1.Conc.H_2SO_4/Δ 2.NBS/hv

(Q)		(2)	$LiAlH_4$
(R)		(3)	Br_2/CCl_4
(S)		(4)	1. $O_3/Zn/H_2O$ 2.$LiAlH_4$ 3.H_3O^+
		(5)	1. $NaOH/\Delta$ 2.CH_3Cl

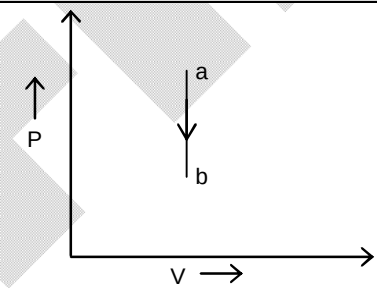
(A) P → 2; Q → 3; R → 5; S → 1
(B) P → 4; Q → 3; R → 1; S → 2
(C) P → 4; Q → 3; R → 2; S → 1
(D) P → 2; Q → 3; R → 5; S → 4

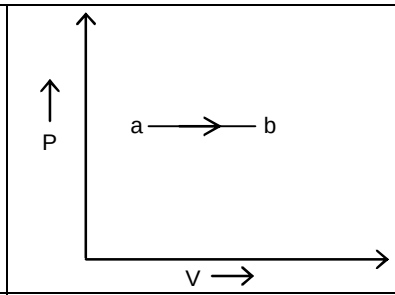
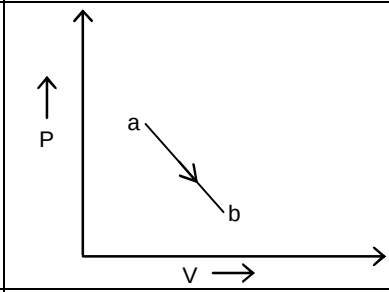
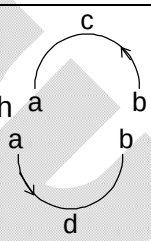
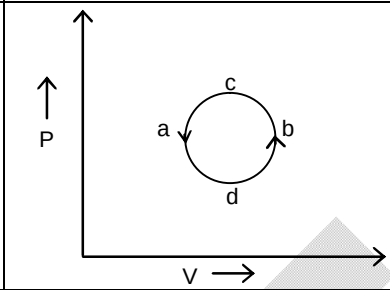
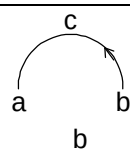
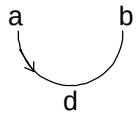
26. Match the lists.

List – I (Molecular orbitals)		List– II (Number of nodal planes)	
(P)	σ^*_{2p}	(1)	One
(Q)	π^*_{2p}	(2)	Two
(R)	σ_{2p}	(3)	Three
(S)	π_{2p}	(4)	Four
		(5)	Five

(A) P → 4; Q → 3; R → 1; S → 2
(B) P → 4; Q → 1; R → 2; S → 3
(C) P → 3; Q → 2; R → 2; S → 1
(D) P → 2; Q → 3; R → 2; S → 4

27. Match the lists.

List – I (Thermodynamic reversible process)		List– II (Characteristics)	
(P)		(1)	a → b is an isothermal process

(Q)		(2)	Along a → b entropy change of system decreases and that of surrounding increases
(R)		(3)	Work done along path  is greater than that along
(S)		(4)	Along a → b entropy change of system increases and that surrounding decreases
		(5)	Work done along path  is than that along  less

(A) P → 4; Q → 2; R → 1; S → 5
(B) P → 1; Q → 4; R → 2; S → 5
(C) P → 2; Q → 4; R → 1; S → 3
(D) P → 4; Q → 1; R → 2; S → 3

28. Match the lists.

List – I (Compounds of boron)		List– II (Properties)	
(P)	$(BN)_x$	(1)	unsymmetrical addition of NH_3 takes place
(Q)	B_2H_6	(2)	Forms more than one products during heating
(R)	$B_3N_3H_6$	(3)	Is used as a lubricant only at high temperature
(S)	H_3BO_3	(4)	Undergoes hydrolysis readily to produce H_3BO_3, NH_3 and H_2
		(5)	Exists in cubic and hexagonal form

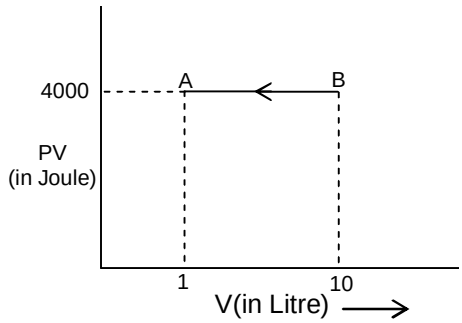
(A) P → 5; Q → 3; R → 2; S → 4
(B) P → 3; Q → 1; R → 3; S → 4
(C) P → 5; Q → 3; R → 4; S → 1
(D) P → 3; Q → 1; R → 4; S → 2

SECTION – B

(Numerical Answer Type)

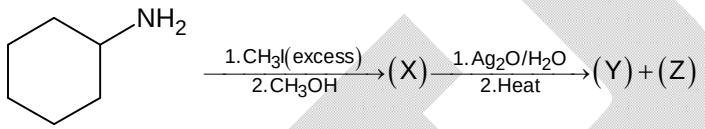
*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

29. How many structural isomer(s) containing four membered ring(s) is/are possible with formula C_4H_5F?

30. 

The work done along the path B → A in above figure in joule unit is

31. How many maximum number of electrons of zinc will have the following magnetic quantum numbers, m = 0, ±1, ±2? [At. no. of Zn = 30]

32. 

If Z is a tertiary amine, how many oxygen atom(s) is/are present in the oxidation product of (Y) using acidified $KMnO_4$ solution as the oxidizing agent?

33. When borax is treated with dilute HCl an oxo acid of boron(X) is formed. Heating of the aqueous solution of (X) results in the formation of a compound(Y) as the end product of heating. Extensive hydrolysis of acid(X) forms another oxo-acid of boron(Z), which on strong heating also forms(Y). What is the molar mass of (Y) in g mol^{-1} unit?
(At. mass of B = 11 g mol^{-1})

34. The boiling point of a solvent increases by 1.56°C if one mole of NaCl is added to a certain volume of the solvent. If NaCl undergoes 80% dissociation in the solution. What is the mass of the solvent in gram unit?
[K_b of the solvent = 0.52 K Kg mol^{-1}]

Mathematics

PART – III

SECTION – A
(One Options Correct Type)

*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

35. Let $z_1 = a + ib$ and $z_2 = c + id$ be two complex numbers such that $|z_1| = |z_2| = 1$ and $\text{Re}(z_1\bar{z}_2) = 0$. If $a, b > 0$ and $c < 0$, then

(A) $0 \le |z_1 - \bar{z}_2| \le 2$ (B) $0 < |z_1 - \bar{z}_2| < \sqrt{2}$

(C) $\sqrt{2} < |z_1 - \bar{z}_2| \le 2$ (D) $\sqrt{2} < |z_1 - \bar{z}_2| < 2$

36. If $\vec{r}.\vec{a} = 0, \vec{r}.\vec{b} = 1$ and $\left[\vec{r}\ \ \vec{a}\ \ \vec{b}\right] = 1, \vec{a}.\vec{b} \neq 0, \left(\vec{a}.\vec{b}\right)^2 - |\vec{a}|^2|\vec{b}|^2 = 1$ the value of $\vec{r}$ in terms of $\vec{a}$ and $\vec{b}$ is

(A) $\vec{a}\times\left(\vec{a}\times\vec{b}\right)+\vec{a}\times\vec{b}$ (B) $\vec{a}\times\left(\vec{a}\times\vec{b}\right)+\dfrac{\vec{a}\times\vec{b}}{|\vec{a}\times\vec{b}|^2}$

(C) $\vec{a}\times\left(\vec{b}\times\vec{a}\right)+\dfrac{\vec{b}\times\vec{a}}{|\vec{b}\times\vec{a}|^2}$ (D) $\dfrac{\vec{a}\times\left(\vec{a}\times\vec{b}\right)}{|\vec{a}\times\left(\vec{a}\times\vec{b}\right)|}+\vec{a}\times\vec{b}$

37. The value of $\sum_{r=0}^{n-1}\left(\dfrac{n+1}{n}\right)\left(\dfrac{r.{}^nC_r\ {}^nC_{r+1}}{r+2}\right)$ is

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

(C) ${}^{2n-1}C_{n-1}$ (D) ${}^{2n}C_{n-2}$

38. Consider the function g defined by $g(x) = \begin{cases} x^2\sin\dfrac{\pi}{x}+(x-1)^2\sin\left(\dfrac{\pi}{x-1}\right), & x \neq 0,1 \\ 0, & \text{if } x = 0,1 \end{cases}$ then which of the following statement is incorrect?

(A) $g(x)$ is differentiable $\forall x \in R$

(B) $g'(x)$ is discontinuous at $x = 0$ but continuous at x = 1

(C) $g'(x)$ is discontinuous at both $x = 0$ and $x = 1$

(D) Rolle's theorem is applicable for $g(x)$ in [0, 1]

SECTION – A
(One or More than one correct type)

*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

39. Let $f(x)$ be twice differentiable function such that $f''(x)<0$ in $[0,2]$. Then

(A) $f(0)+f(2)=2f(c), 0<c<2$ (B) $f(0)+f(2)=2f(1)$

(C) $f(0)+f(2)>2f(1)$ (D) $f(0)+f(2)<2f(1)$

40. The volume of the parallelepiped whose coterminous edges are represented by the vectors $2\vec{b}\times\vec{c}$, $3\vec{c}\times\vec{a}$ and $4\vec{a}\times\vec{b}$, where $\vec{a}=(1+\sin\theta)\hat{i}+\cos\theta\hat{j}+\sin 2\theta\hat{k}$,

$\hat{b}=\sin\left(\theta+\frac{2\pi}{3}\right)\hat{i}+\cos\left(\theta+\frac{2\pi}{3}\right)\hat{j}+\sin\left(2\theta+\frac{4\pi}{3}\right)\hat{k}$,

$\vec{c}=\sin\left(\theta-\frac{2\pi}{3}\right)\hat{i}+\cos\left(\theta-\frac{2\pi}{3}\right)\hat{j}+\sin\left(2\theta-\frac{4\pi}{3}\right)\hat{k}$ is 18 cubic units, then the value of θ, in the interval $\left(0,\frac{\pi}{2}\right)$, is are

(A) $\frac{\pi}{9}$ (B) $\frac{2\pi}{9}$

(C) $\frac{\pi}{3}$ (D) $\frac{4\pi}{3}$

41. The number of solutions of equation $8\sin x=\frac{\sqrt{3}}{\cos x}+\frac{1}{\sin x}$

(A) 6 if $x\in(0,2\pi)$ (B) 4 if $x\in(0,\pi)$

(C) 5, if $x\in\left(0,\frac{3\pi}{2}\right)$ (D) There does not exist any solution

SECTION – A
(Matching List Type)

*This section contains **FOUR (04)** Matching List Type Questions. Each question has FOUR statements in **List-I** entries (P), (Q), (R) and (S) and FIVE statements in **List-II** entries (1), (2), (3), (4) and (5). The codes for lists have choices (A), (B), (C), (D) out of which **ONLY ONE** of these four options is correct answer.*

42. Let π be plane parallel to y axis containing the points (1, 0, 1) and (3, 2, –1). Also $A=(4,0,0)$ and $B=(6,0,-2)$ are two points and $P=(x_0,y_0,z_0)$ is a variable point on the plane $\pi=0$

List - I		List - II	
(P)	If equation of plane $\pi=0$ is $x+ay+bz=c$ then $\lvert a+b+c\rvert$ is	(1)	16
(Q)	If $(PA+PB)$ is minimum then $\lvert 4x_0+y_0+2z_0\rvert$ is	(2)	12
(R)	If $\lvert PA-PB\rvert\in\left[0,\sqrt{N}\right)$ the N is	(3)	3

(S)	If reflection of line AB in the plans $\pi = 0$ is $\frac{x-2}{1} = \frac{y-\alpha}{0} = \frac{z+\beta}{-1}$ then $\left(\alpha^4 + \beta^4\right)$ is	(4)	8
		(5)	10

(A) P $\rightarrow$ 3, Q $\rightarrow$5, R $\rightarrow$4, S $\rightarrow$1 (B) P $\rightarrow$ 3, Q $\rightarrow$2, R $\rightarrow$4, S $\rightarrow$1
(C) P $\rightarrow$ 3, Q $\rightarrow$2, R $\rightarrow$5, S $\rightarrow$1 (D) P $\rightarrow$ 5, Q $\rightarrow$2, R $\rightarrow$4, S $\rightarrow$1

43. Match the following

List - I		List - II	
(P)	In an A.P. series containing 99 terms, the sum of all the odd numbered terms is 2550. The sum of all the 99 terms of the A.P. is	(1)	5010
(Q)	f is a function for which $f(1) = 1$ and $f(n) = n + f(n-1)$ for each $n \geq 2$, $n \in \mathbb{N}$. The value of $f(100)$ is	(2)	5049
(R)	Suppose, $f(n) = \log_2(3).\log_3(4).\log_4(5).....\log_{n-1}(n)$ then the sum $\sum_{k=2}^{100} f\left(2^k\right)$ equals	(3)	5050
(S)	Concentric circles of radii 1, 2, 3,….100 cm are drawn. The interior of the smallest circle is coloured red and the annular regions are coloured alternatively green and red so that no two adjacent regions are of the same color. The total area of the green regions in sq. cm is $k\pi$ then 'k' equals	(4)	5100
		(5)	5051

The correct option is
(A) P$\rightarrow$(2) Q $\rightarrow$ (3) R$\rightarrow$(2) S$\rightarrow$(3) (B) P$\rightarrow$(2) Q $\rightarrow$ (4) R$\rightarrow$(1) S$\rightarrow$(5)
(C) P$\rightarrow$(3) Q $\rightarrow$ (3) R$\rightarrow$(4) S$\rightarrow$(4) (D) P$\rightarrow$(1) Q $\rightarrow$ (5) R$\rightarrow$(3) S$\rightarrow$(4)

44. Match each entry in **List – I** to the correct entries in **List – II**

List – I		List – II	
(P)	Distance between the points on the curve $4x^2 + 9y^2 = 1$, where tangent is parallel to the line $8x = 9y$, is	(1)	$\frac{16}{5}$
(Q)	Sum of distances of the foci of the curve $25(x+1)^2 + 9(y+2)^2 = 225$ from (–1, 0) is	(2)	3
(R)	Sum of distances from the x – axis of the points on the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, where the normal is parallel to the line $2x + y = 1$, is	(3)	$\frac{2}{\sqrt{5}}$
(S)	Tangents are drawn from points on the line $x - y + 2 = 0$ to the ellipse $x^2 + 2y^2 = 2$, then all the chords of contact pass through the point whose distance from $\left(2, \frac{1}{2}\right)$ is	(4)	8
		(5)	1

(A) P $\rightarrow$ 3, Q $\rightarrow$2, R $\rightarrow$1, S $\rightarrow$4 (B) P $\rightarrow$ 3, Q $\rightarrow$2, R $\rightarrow$5, S $\rightarrow$4
(C) P $\rightarrow$ 3, Q $\rightarrow$4, R $\rightarrow$1, S $\rightarrow$2 (D) P $\rightarrow$ 3, Q $\rightarrow$1, R $\rightarrow$2, S $\rightarrow$4

45. Match the following

	List - I		List - II
(P)	The number of integral values of 'a' for which point (a, a^2) lies completely inside the triangle formed by lines $x = 0,\ y = 0,\ 2y + x = 3$.	(1)	0
(Q)	The number of values of a of the form $\frac{K}{3}$ where $K \in I$ so that point (a, a^2) lies between the lines $x + y = 2$ and $4x + 4y - 3 = 0$	(2)	1
(R)	The reflection of point $(t-1, 2t+2)$ in a line is $(2t+1, t)$ then the slope of line is	(3)	2
(S)	In a triangle ABC, the bisector of angles B and C lie along the lines $y = x$ and $y = 0$. If A is (1, 2) then $\sqrt{10}\, d(A, BC)$ equals (where d (A, BC) denotes the perpendicular distance of A from BC)	(4)	4
		(5)	3

(A) P $\to$ 3, Q $\to$2, R $\to$1, S $\to$4 (B) P $\to$ 3, Q $\to$4, R $\to$1, S $\to$2

(C) P $\to$1, Q $\to$4, R $\to$5, S $\to$2 (D) P $\to$ 1, Q $\to$3, R $\to$2, S $\to$4

SECTION – B
(Numerical Answer Type)

*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

46. A bag contains 4 tickets numbered 1, 2, 3, 4 and another bag contains 6 tickets numbered 2, 4, 6, 7, 8, 9. One bag is chosen and a ticket is drawn. The probability that the ticket bears the number 4, is equal to $\frac{A}{B}$ (where A and B are co prime) then the value of $A + B$ is

47. If $f : R \to R$ is a function such that $f(x) = x^3 + x^2 f'(1) + xf''(2) + f'''(3)$ for all $x \in R$, then $f(1) - f(2)$ is

48. Let $f(x) = ax^4 + bx^2 + 3x + 7$ and $f(-4) = 2286$ and $f(4) = N$. If K be the number of ways in which the number N can be resolved as a product of two divisors which are relatively prime then K equals to

49. The 20^{th} term of an arithmetic sequence is $\log_{10} 20$ and the 32^{nd} term is $\log_{10} 32$. If exactly one term of the arithmetic sequence is a rational number which in lowest form is $\frac{p}{q}; (p, q \in N)$ then (p + q) = _____

50. Let z and ω be complex numbers such that $z + \omega = i$ and $z^2 + \omega^2 = 1$. If area of triangle formed by z, ω and origin is equal to A, then find the value of $16A^2$.

51. Let $f(x) = x^3 + 3x + 2$ and $g(x)$ be its inverse. If the area bounded by $g(x)$, x – axis and the ordinates x = – 2 and x = 6 is $\frac{p}{q}$ (where p & q are coprime), find value of $p + q - 1$