FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
FULL TEST – III
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.

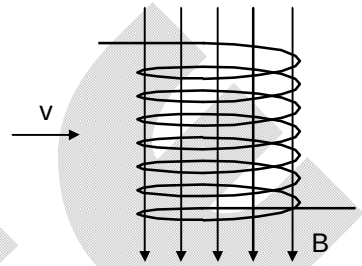
Physics

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.*

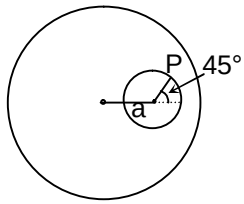
1. A direct current flowing through the winding of a long cylindrical solenoid of radius *R* produces in it a uniform magnetic field of induction *B*. An electron flies into the solenoid along the radius between its turns (at right angles to the solenoid axis) at a velocity *v* as shown in figure. After a certain time, the electron deflected by the magnetic field leaves the solenoid. Then the time *t* during which the electron moves in the solenoid is



(A) $\frac{m}{eB}\tan^{-1}\left(\frac{eBR}{mv}\right)$ (B) $\frac{2m}{eB}\tan^{-1}\left(\frac{eBR}{mv}\right)$

(C) $\frac{m}{eB}\tan^{-1}\left(\frac{mv}{eBR}\right)$ (D) $\frac{2m}{eB}\tan^{-1}\left(\frac{mv}{eBR}\right)$

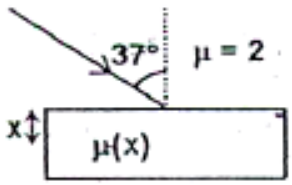
2. A cavity of radius *r* is made inside a solid sphere. The volume charge density of the remaining sphere is ρ. An electron (charge *e*, mass *m*) is released inside the cavity from point *P* as shown in figure. The centre of sphere and centre of cavity are separated by a distance *a*. The time after which the electron again touches the sphere is



(A) $\sqrt{\frac{6\sqrt{2}r\varepsilon_0 m}{e\rho a}}$ (B) $\sqrt{\frac{\sqrt{2}r\varepsilon_0 m}{e\rho a}}$

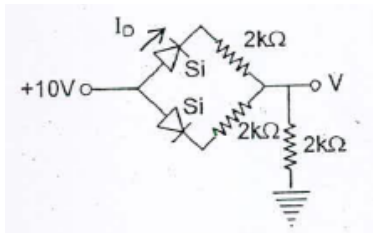
(C) $\sqrt{\frac{6r\varepsilon_0 m}{e\rho a}}$ (D) $\sqrt{\frac{r\varepsilon_0 m}{e\rho a}}$

3. A ray of light, travelling in a medium of refractive index 2, is incident onto the flat surface of a slab, the angle of incidence being 37°. The refractive index of the material of the slab varies with depth(x) from the top surface, $\mu(x) = 2 - x$, where x is in 'm'. The maximum depth reached by the ray is (take $\sin 37° \approx 0.6$).



(A) 8/5 m (B) 6/5 m
(C) 3/5 m (D) 4/5 m

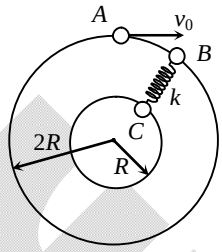
4. Determine V_0 and I_D for the network shown in the figure.
(A) 1.55 mA, 3.1 Volt
(B) 2.55 mA, 3.1 Volt
(C) 1.55 mA, 6.2 Volt
(D) 3.55 mA, 6.2 Volt



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. Three particles each of mass m, can slide on fixed frictionless circular tracks in the same horizontal plane as shown. Particle A moves with velocity v_0 and hits particle B elastically. Assuming that B and C are initially at rest and lie along a radial line and the spring is initially relaxed before impact, then



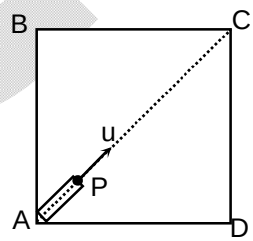
(A) the velocity of B immediately after impact is v_0

(B) the velocity of C when the stretch in the spring is maximum is $\frac{2v_0}{5}$

(C) the velocity of B when the stretch in the spring is maximum is $\frac{4v_0}{5}$

(D) the maximum stretch in the spring in the spring is $\sqrt{\frac{m}{5k}}v_0$

6. A large rectangular box $ABCD$ falls vertically with an acceleration a. A toy gun fixed at A and aimed towards C, fires a particle P



(A) P will hit C if $a = g$

(B) P will hit the roof BC if $a > g$

(C) P will hit the wall CD or the floor AD if $a < g$.

(D) may be either (a), (b) or (c), depending on the speed of projection of P.

7 A particle of mass m is moving in the space under the influence a force $\vec{F} = \vec{v} \times \vec{A}$, where $\vec{v}$ is the velocity of particle and $\vec{A}$ is constant vector, given as $\vec{A} = A\hat{k}$. At t = 0, particle is at origin and moving with initial velocity $\vec{v}_0 = v_1\hat{i} + v_2\hat{k}$. Choose the CORRECT statement(s).

(A) the magnitude of linear momentum of the particle is constant.

(B) velocity of particle at any time t is $v_1\cos\left(\frac{A}{m}t\right)\hat{i} - v_1\sin\left(\frac{A}{m}t\right)\hat{j} + v_2\hat{k}$

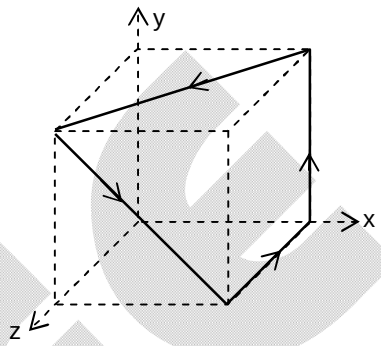
(C) particle will perform motion on helical path with constant pitch.

(D) magnitude of angular velocity of the particle is variable.

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.*

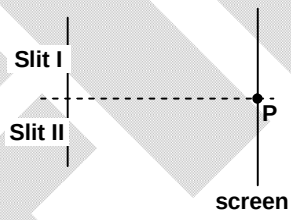
8. A wire carrying a 10A current is bent to pass through various sides of a cube of side 10cm as shown in figure. A magnetic field $\vec{B} = (2\hat{i} - 3\hat{j} + \hat{k})$ T is present in the region. (Take the mass of cube 50gm). Match List-I with List-II)



List–I	List–II
(P) magnitude of force on the loop	(1) $\sqrt{150} \times 10^{-2}$ (SI unit)
(Q) magnitude of magnetic moment of loop	(2) $\sqrt{20} \times 10^{-1}$ (SI unit)
(R) magnitude of torque on the loop	(3) $\sqrt{13} \times 10^{2}$ (SI unit)
(S) magnitude of acceleration of loop	(4) zero

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

9. A double slit interference pattern is produced on a screen, as shown in the figure, using monochromatic light of wavelength 500 nm. Point P is the location of the central bright fringe, that is produced when light waves arrive in phase without any path difference. A choice of three strips A, B and C of transparent materials with different thicknesses and refractive indices is available, as shown in the table. These are placed over one or both of the slits, singularly or in conjunction, causing the interference pattern to be shifted across the screen from the original pattern. In the column-I, how the strips have been placed, is mentioned whereas in the column –II, order of the fringe at point P on the screen that will be produced due to the placement of the strip(s), is shown. Correctly match both the column.

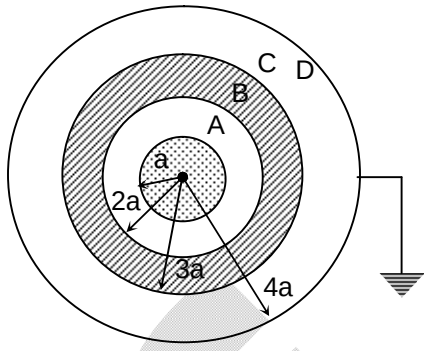


Film	A	B	C
Thickness (in μm)	5	1.5	0.25
Refractive index	1.5	2.5	2

	List– I		List– II
(P)	Only strip B is placed over slit-I	(1)	First bright
(Q)	Strip A is placed over slit-I and strip C is placed over slit – II	(2)	Fourth dark
(R)	Strip A is placed over slit-I and strip B and strip C are placed over slit – II in conjunction.	(3)	Fifth dark
(S)	Strip A and strip C are placed over slit-I (in conjunction) and strip B is placed over slit – II	(4)	Central bright

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

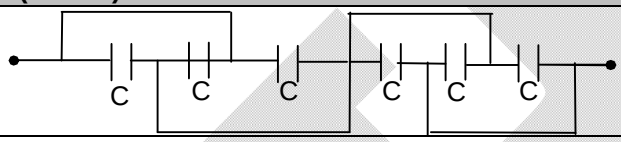
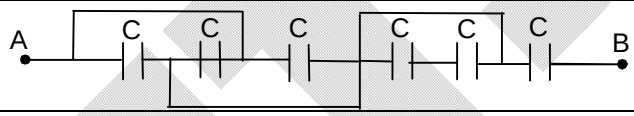
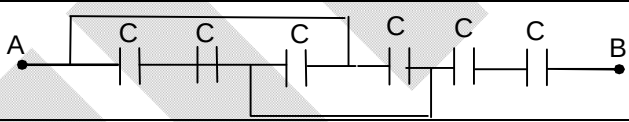
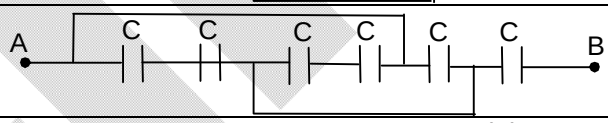
10. A conducting sphere of radius *a* is placed inside a thin conducting shell of radius 4*a*. Now a dielectric shell of inner radius 2*a* and outer radius 3*a* is placed between sphere and shell concentrically. A is the outer surface of the sphere, B is the inner surface of the dielectric shell, C is the outer surface of dielectric shell and D is the inner surface of conducting shell. The charge $+q$ is given to the outer surface of sphere A.



List –I		List –II	
(P)	Surface A	(1)	Charge is $-q$
(Q)	Surface B	(2)	Charge is $+q$
(R)	Surface C	(3)	Charge is $+q\left(1-\frac{1}{k}\right)$
(S)	Surface D	(4)	Charge is $-q\left(1-\frac{1}{k}\right)$

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

11. Match List I with List II:

List –I (Circuit)		List –II (C_{eq})	
(P)		(1)	$\frac{3C}{4}$
(Q)		(2)	$\frac{5C}{12}$
(R)		(3)	$\frac{2C}{3}$
(S)		(4)	$\frac{3C}{2}$

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

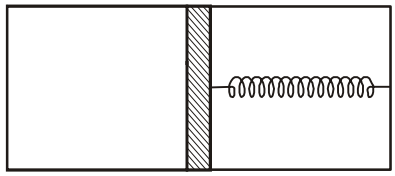
SECTION – B

(Numerical Answer Type)

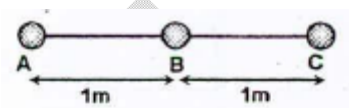
*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

12. A point object located at a distance of 20 cm from the pole of a concave mirror of focal length 30 cm with height 2 cm is moving with a velocity $\left(\vec{V}_{OG}=4\hat{i}-5\hat{j}\right)$ m/s and the velocity of the mirror is $\left(\vec{V}_{MG}=-6\hat{i}+10\hat{j}\right)$ m/s. The velocity of the image w.r.t. ground is given by $\left(-x\hat{i}-41\hat{j}\right)$. Find (x).

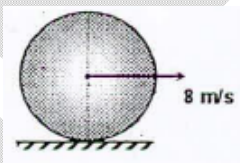
13. A thermally insulated vessel is divided into two parts by a heat insulating piston which can move in the vessel without friction. The left part of the vessel contains one mole of an ideal monoatomic gas and the right part is empty. The piston is connected to the right wall by spring whose length in free state is equal to length of vessel. Heat capacity C of the system, neglecting the heat capacities of the vessel, piston and spring is found to be R $\times$ X. The value of *X* is



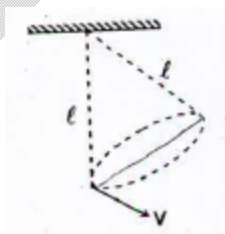
14. Three identical balls A, B and C each of mass m = 3 kg are connected by strings AB and BC as shown in the figure. The whole system is placed on a smooth horizontal surface. Now the ball B is given an initial velocity v0 = $\sqrt{3}$ m/s, perpendicular to the strings and along the horizontal surface. Find the tension (in Newton) in the string just before the balls A and C collide.



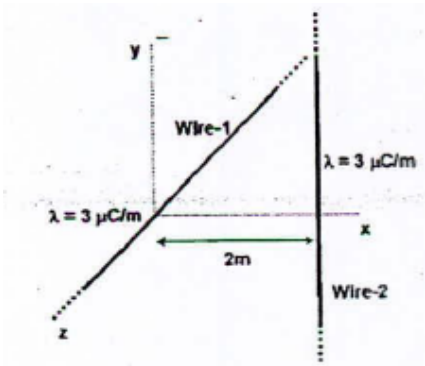
15. A 10 kg solid sphere of radius r = 0.8 m is rolling without slipping on a horizontal rough surface with 8 m/s. The force applied by the right half of the sphere on the left half is 30x Newton. Find the value of x.



16. A positively charged particle of charge q and mass m is suspended from a point by a string of length ℓ. In the entire space a uniform horizontal electric field E exists. The particle is drawn aside so that string becomes vertical and then it is projected horizontally with velocity v such that particle starts to move along a circle with same constant speed v. If v equals $\frac{nqE}{3m}\sqrt{\frac{\ell}{g}}$, find the value of n.



17. A long wire has uniform charge density λ = 3 μC/m is kept along z-axis. Another similar wire 2 is lying on x-y plane such that the minimum separation between them is d = 2 m. Calculate the work done (in Joule) in moving the wire-2 upto origin. (approximately)



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. One mole of diatomic ideal gas undergoing a process in which absolute temperature is directly proportional to cube of volume, then, heat capacity of process is

(A) $\frac{10}{3}R$ (B) $\frac{11}{6}R$

(C) $\frac{17}{6}R$ (D) $3R$

19. A certain mass of gas is expanded from (1L, 10 atm) to 4 L, 5 atm) against a constant external pressure of 1 atm. If initial temperature of gas is 300 K and the heat capacity of process is $50\,J/^{o}C$. Then the enthalpy change during the process is:

(1 L atm $\simeq$ 100 J)

(A) $\Delta H = 15\,kJ$ (B) $\Delta H = 15.7\,kJ$

(C) $\Delta H = 14.4\,kJ$ (D) $\Delta H = 14.7\,kJ$

20. $M + \text{dil HCl} \longrightarrow \text{white ppt} \xrightarrow{H_2O} \text{is soluble in } H_2O$

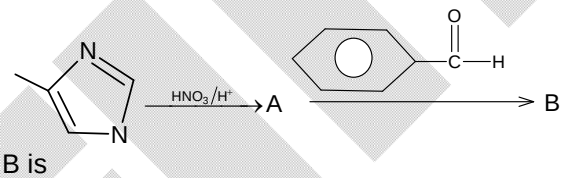
$\downarrow K_2Cr_2O_7$

Brick Red colour

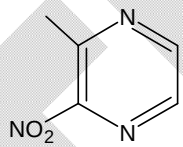
Hence M is

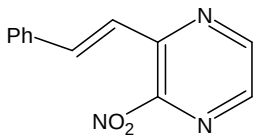
(A) Ag^{+} (B) H_2^{+2}

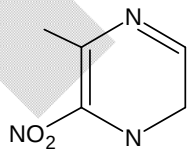
(C) Hg^{+2} (D) Pb^{+2}

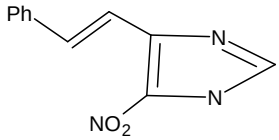
21. 

B is

(A) 

(B) 

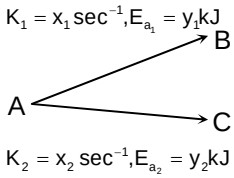
(C) 

(D) 

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. Choose the correct statements regarding above chemical reaction:
(Given that $y_1 > y_2$)



(A) Overall rate of reaction is equal to sum of formation of B and C.

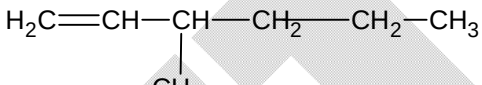
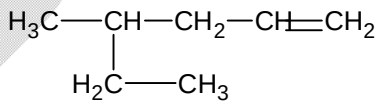
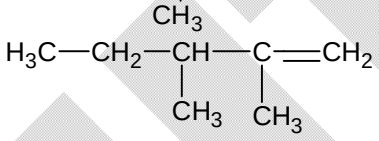
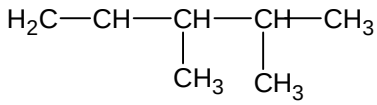
(B) Overall activation energy of the reaction $E_a = \dfrac{x_1y_1 + x_2y_2}{x_1 + x_2}$

(C) Half life of reaction is $\dfrac{\ell n2}{x_1 + x_2}$

(D) As the temperature decreases rate of reaction of both reactions decreases but ratio of rate of reaction $A \longrightarrow C$ decreases more than $A \longrightarrow B$.

23. Which of the following processes do not involve absorption of energy?
(A) $S(g) + e^- \rightarrow S^-(g)$
(B) $O^-(g) + e^- \rightarrow O^{2-}(g)$
(C) $Cl(g) + e^- \rightarrow Cl^-(g)$
(D) $O(g) + e^- \rightarrow O^-(g)$

24. C_7H_{14} (an optically active alkene) on catalytic reduction gives optically active product. The probable structures of C_7H_{14} can be

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

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. Matching the Following

List-I		List-II	
(P)	$(NH_4)_2Cr_2O_7$	(1)	Gives N_2O on heating
(Q)	$FeSO_4$	(2)	Gives CO_2 on heating
(R)	$Mg(HCO_3)_2$	(3)	Gives SO_2 and SO_3 on heating
(S)	NH_4NO_3	(4)	Gives N_2 on heating

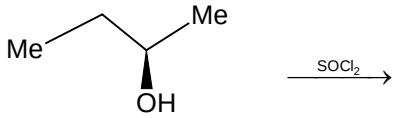
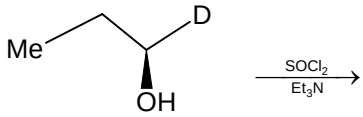
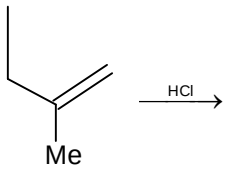
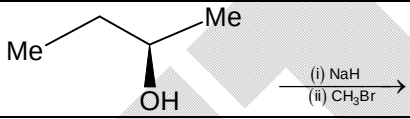
(A) P-4; Q-3; R-2; S-1
(B) P-3; Q-4; R-2; S-1
(C) P-4; Q-3; R-1; S-2
(D) P-3; Q-4; R-1; S-2

26. Match the matrix

List-I		List-II	
(P)	$AgNO_3(aq.)$	(1)	$NaOH(excess)$
(Q)	$ZnSO_4(aq.)$	(2)	H^+/H_2S
(R)	$CuSO_4(aq.)$	(3)	$NH_4OH(Excess)$
(S)	$Fe(NO_3)_3(aq.)$	(4)	KCl
		(5)	$K_4[Fe(CN)_6]$

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

27. Match the following

List-I (reaction)		List-II(Comment on major product and intermediate)	
(P)		(1)	Optically active compound
(Q)		(2)	Inversion of configuration
(R)		(3)	Retention of configuration
(S)		(4)	Optically inactive compound
		(5)	Carbocation intermediate

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

28. Match the List-I & List-II

List-I			List-II
(P)	Ni^{2+}	(1)	Produce blue aq. solution
(Q)	Cr^{2+}	(2)	Half-filled t_{2g} orbitals in octahedral complex
(R)	V^{2+}	(3)	Diamagnetic ion
(S)	Ti^{4+}	(4)	Calculate $\mu = 2.84$ B.M. (spin only)

(A) P-2, Q-4, R-3, S-1
(B) P-4, Q-2, R-3, S-1
(C) P-4, Q-1, R-2, S-3
(D) P-1, Q-2, R-3, S-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**.*

29. 1.575g of oxalic acid $(COOH)_2.xH_2O$ is dissolved in water and the volume made upto 250 mL. On titration 16.66 mL of this solution required 25 mL of N/15NaOH solution for complete neutralization. Calculate x.

30. A compound A dissociates by two parallel first order paths at certain temperature

$A(g) \xrightarrow{k_1(min^{-1})} 2B(g) \quad k_1 = 6.93\times10^{-3}\ min^{-1}$

$A(g) \xrightarrow{k_2(min^{-1})} C(g) \quad k_2 = 6.93\times10^{-3}\ min^{-1}$

The reaction is started with 1 mole of pure 'A' in 1 litre closed container with initial pressure 2 atm. What is the pressure (in atm) developed in container after 50 minutes from start of experiment? If pressure is written as x + y and the value of y is 0.5. Find the value of x.

31. Radiation corresponding to the transition n = 4 to n = 2 in hydrogen atoms falls on a certain metal (work function = 2.5 eV). The maximum kinetic energy of the photo-electrons will be, the kinetic energy is expressed as 0.0x. Find the value of x?

32. What is the normal boiling point of mercury (in K)

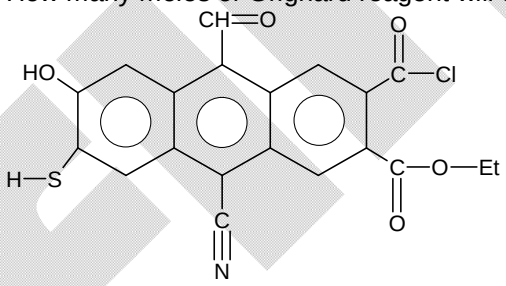
Given: $\Delta H_f^o(Hg,l) = 0; S^o(Hg,l) = 77.4\,J/K-mol$

$\Delta H_f^o(Hg,g) = 60.8kJ/mol; S^o(Hg,g) = 174.4\,J/K-mol$

Boiling points equal to 208.7 $\times$ x, find the value of x = 3

33. A sample of ammonia contains only H^1 and H^2 isotopes of hydrogen in 4:1 ratio and N^{14} and N^{15} isotopes of nitrogen in 3 : 1 ratio. How many neutrons are present in 1.785 mg ammonia? (Answer in the order 10^{18}) ($N_A = 6\times10^{23}$). Answer has been expressed as 235.5 $\times$ x. Find the value of x = 2

34. How many moles of Grignard reagent will consume when it reacts with following compound?



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. If the area bounded by $f(x) = \sqrt{1+x^2}\,(x > 0)$ the line y = x, y axis and y = –x + a(a>1) is k, then area bounded by the graph of $f^{-1}(x)$, the line y = x between the lines y = –x + 1 and y = –x + a is

(A) $\frac{k-1}{4}$ (B) $\frac{2k-1}{2}$

(C) k (D) $\frac{4k-1}{4}$

36. In a acute angle triangle ABC, the foot of the perpendicular from A divide the opposite side into two parts of length 3 and 17 units and $\tan A = \frac{22}{7}$, the $\left(\frac{\text{Area of } \Delta ABC}{22}\right)$ is

(A) $\frac{5}{2}$ (B) 5

(C) 10 (D) 20

37. The digits of three digit number N are in A.P. If sum of the digits is 15 and the number obtained by reversing the digits of the number is 594 less the original number, then $\frac{1000}{N-252}$ is equal to :

(A) $\frac{5}{6}$ (B) $\frac{5}{3}$

(C) 0.06 (D) 0.03

38. A flagstaff stands vertically on a pillar, the height of the flagstaff being double the height of the pillar. A man on the ground at a distance finds that both the pillar and the flagstaff subtend equal angles at his eyes. The ratio of the height of the pillar and the distance of the man from the pillar, is

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

(C) $1:\sqrt{3}$ (D) $\sqrt{3}:2$

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).*

39. Let $L_1 : \frac{x-1}{2} = \frac{y+1}{-2} = \frac{z-0}{-1}$ and $L_2 : \frac{x-0}{5} = \frac{y+2}{-8} = \frac{z-0}{-1}$.

Which of the following is/are correct.

(A) The shortest distance between L_1 and L_2 is 1 unit

(B) Equation of plane containing L_1 and parallel to line L_2 is 2x + y + 2z – 1 = 0

(C) equation of line of shortest distance of L_1 and L_2 is $\frac{x+1}{2} = \frac{y-1}{1} = \frac{z-1}{2}$

(D) The shortest distance between L_1 and L_2 is 2 units.

40. Consider a cube of side length 9 units. Let (x, y, z) be coordinates of points on or inside the cube such that x, y, z $\in$ I and $0 \le x, y, z \le 9$. If total number ways of selecting two distinct points among these such that their mid-point is also having integral coordinates is N, then
(A) N is divisible by 30
(B) N is divisible by 31
(C) N is divisible by 32
(D) Number of factors of N is 40

41. If $f(x) = \dfrac{1-\cos(3x^2-5x-2)}{(x-2)^2}$, then
(A) $\lim\limits_{x\to 2} f(x) = \dfrac{49}{2}$
(B) $\lim\limits_{x\to 2} f(x) = \dfrac{1}{2}$
(C) f(x) is always continuous in its domain
(D) the number of points of discontinuity of f(x) is infinite.

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. Match the List– I & List–II

	List–I	List–II	
(P)	A straight line with negative slope passing through (1, 4) meets the coordinate axes at A and B. The minimum length of OA + OB, O being the origin, is	(1)	$5\sqrt{2}$
(Q)	If the point P is symmetric to the point Q(4, –1) with respect to the bisector of the first quadrant, then the length of PQ is	(2)	$3\sqrt{2}$
(R)	On the portion of the straight line x + y = 2 between the axis a square is constructed away from the origin, with this portion as one of its sides. If d denotes the perpendicular distance of a side of this square from the origin then the maximum value of d is	(3)	9/2
(S)	If the parametric equation of a line is given $x = 4 + \lambda/\sqrt{2}$ and $y = -1 + \sqrt{2}\lambda$, where λ is a parameter, then the intercept made by the line on the x-axis is	(4)	9

(A) P $\to$ 3; Q $\to$1; R $\to$ 2; S $\to$ 4
(B) P $\to$ 4; Q $\to$1; R $\to$ 2; S $\to$ 3
(C) P $\to$ 4; Q $\to$3; R $\to$ 2; S $\to$ 1
(D) P $\to$ 1; Q $\to$4; R $\to$ 2; S $\to$ 3

43. Match the List–I & List–II

	List–I	List–II	
(P)	The smallest integer greater than $\dfrac{1}{\log_3 \pi} + \dfrac{1}{\log_4 \pi}$ is	(1)	10
(Q)	Let $3^a = 4, 4^b = 5, 5^c = 6, 6^d = 7, 7^e = 8$, and $8^f = 9$. Then the value of the product (abcdef) is	(2)	3
(R)	Characteristic of the logarithm of 2008 to the base 2 is	(3)	1
(S)	If $\log_2(\log_2(\log_3 x)) = \log_2(\log_3(\log_2 y)) = 0$, then the value of (x – y) is	(4)	2

(A) P $\to$ 3; Q $\to$ 4; R $\to$ 1; S $\to$ 2
(B) P $\to$ 4; Q $\to$ 2; R $\to$ 1; S $\to$ 3
(C) P $\to$ 2; Q $\to$ 4; R $\to$ 1; S $\to$ 3
(D) P $\to$ 2; Q $\to$ 3; R $\to$ 1; S $\to$ 4

44. Match the following List-I with List–II

List–I		List–II	
(P)	$\lim\limits_{x\to 0}\dfrac{1-\cos 2x}{e^{x^2}-e^x+x}$ equals to	(1)	1
(Q)	If the value of $\lim\limits_{x\to 0^+}\left(\dfrac{(3/x)+1}{(3/x)-1}\right)^{1/x}$ can be expressed in the form of $e^{p/q}$, where p and q are relative prime, then (p + q) is equal to	(2)	2
(R)	$\lim\limits_{x\to 0}\dfrac{\tan^3 x-\tan x^3}{x^5}$ equals to	(3)	4
(S)	$\lim\limits_{x\to 0}\dfrac{x+2\sin x}{\sqrt{x^2+2\sin x+1}-\sqrt{\sin^2 x-x+1}}$ equals to	(4)	5

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

45. Let Π be the plane parallel to y-axis and containing the points (1, 0, 1) and (3, 2, -1). 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 Π = 0.
Match List – I with List – II and select the correct answer using the code given below the list.

List - I		List - I	
(P)	If the equation of the plane Π = 0 is x + ay + bz = c, then |a + b + c| is	(1)	16
(Q)	If (PA + PB) is minimum, then $\lvert 4x_0+y_0+2z_0\rvert$ is	(2)	12
(R)	If |PA + PB| ∈ $[0, \sqrt{N})$, then N is	(3)	3
(S)	If the reflection of the line AB in the plane $\Pi = 0$ is $\dfrac{x-2}{1}=\dfrac{y-\alpha}{0}=\dfrac{z+\beta}{-1}$, then $(\alpha^4+\beta^4)$	(4)	8
		(5)	10

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

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. In the coordinate plane, the region M consists of all the points (x, y) satisfying the inequalities $y \ge 0,\ y \le x\,y$ and $y \le 2-x$ simultaneously. The region N, which varies with the parameter t, consists of all the points (x, y) satisfying the inequalities $t \le x \le t+1$ and $0 \le t \le 1$ simultaneously. The area of $M \cap N$ is $-k_1t^2+k_2t+\dfrac{1}{2}$, then $k_1 + k_2$ is _____ .

47. The slope of the tangent to the curve represented by $x = t^2 + 3t - 8$ and $y = 2t^2 - 2t - 5$ at the point $M(2, 1)$ is $\left(\dfrac{\lambda}{7}\right)$, then value of λ is ?

48. Let $(1+3x+4x^2)=a_0+a_1x+a_2x^2+..+a_{20}x^{20}$. Then value of a_3 is –

49. Find the value of $f\left(\frac{\pi}{6}\right)$, where $f(\theta)=\begin{vmatrix} \cos^2\theta & \cos\theta\sin\theta & -\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta & \cos\theta \\ \sin\theta & -\cos\theta & 0 \end{vmatrix}$

50. A number a = nnnnnn (6 digit number and all digit repeated) is divisible by 924. Let n and m are the roots of the equation $x^2 - 11x + k = 0$, if product of all possible values of k then the value of 6(greatest product) **:** (least product) of n and m.

51. The area of the region of the xy-plane defined by the inequality $|x|+|y|+|x+y| \le 2$ is