FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
FULL TEST – XI
PAPER –1
TEST DATE: 11-05-2025

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 particle starts from rest and moves in a straight line with initial acceleration a_0. The acceleration reduces continuously to half of its value in every t_0 seconds. The terminal velocity of the particle is

(A) $\frac{a_0 t_0}{2\ell n2}$ (B) $\frac{2a_0 t_0}{\ell n2}$

(C) $\frac{a_0 t_0}{\ell n2}$ (D) $\frac{a_0 t_0}{3\ell n2}$

2. The activity of a sample of radioactive material is R_1 at time t_1 and R_2 at time $t_2 (t_2 > t_1)$. If mean life of the radioactive sample is T, then

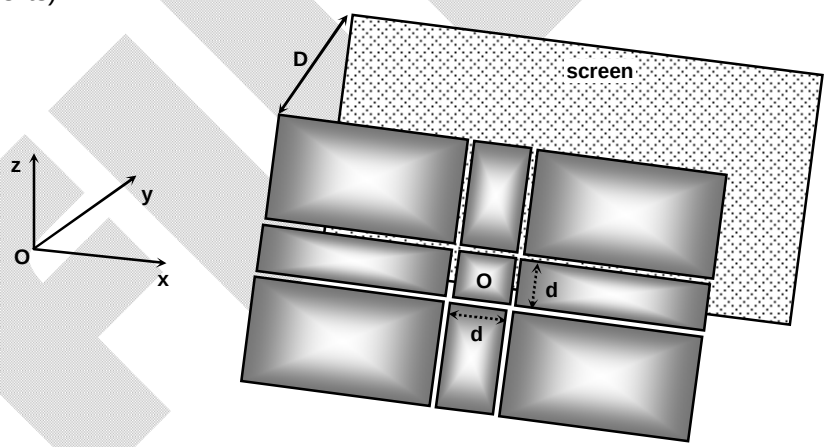
(A) $R_1 t_1 = R_2 t_2$ (B) $\frac{R_1 - R_2}{t_2 - t_1}$ = constant

(C) $R_2 = R_1 \exp\left(\frac{t_1 - t_2}{T}\right)$ (D) $R_2 = R_1 \exp\left(\frac{t_1}{Tt_2}\right)$

3. Ram pushes eight identical blocks on the horizontal frictionless surface with horizontal force F. The force that block-1 exerts at block-2 has magnitude F_{21} and the force that block – 7 exerts on the block-8 is F_{87}. Find $\frac{F_{21}}{F_{87}}$.

(A) 2 (B) 4
(C) 5 (D) 7

4. Four slits are made in an infinitely large sheet as shown (O is the symmetrical point of the four slits):



Find the co-ordinates of the black spots formed on the screen on performing interference experiment with this arrangement (using light of wavelength λ), (m and n are integers):

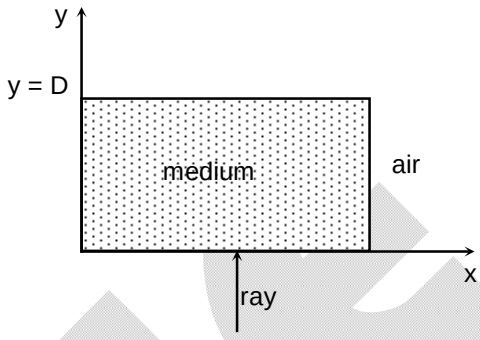
(A) $\left[\frac{m\lambda D}{d}, D, \frac{n\lambda D}{d}\right]$ (B) $\left[\frac{(2m+1)\lambda D}{2d}, D, \frac{(2n+1)\lambda D}{2d}\right]$

(C) $\left[\frac{(2m-1)\lambda D}{2d}, D, \frac{n\lambda D}{d}\right]$ (D) $\left[\frac{m\lambda D}{d}, D, \frac{(2n-1)\lambda D}{2d}\right]$

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. A transparent slab is placed in x-y plane as shown in the figure. The refractive index of the medium is given as $\mu = \mu_0\left[1+\alpha\frac{y}{D}\right]$, where $\alpha = 2$. A ray is incident perpendicularly on the medium as shown in the diagram. Then,

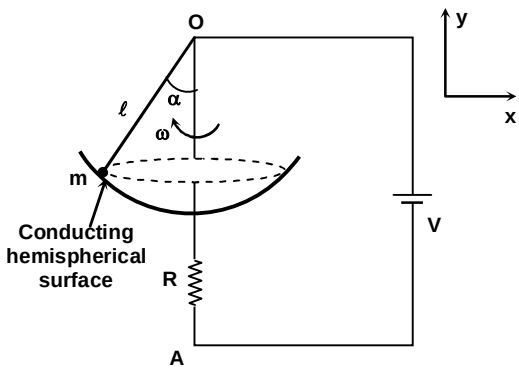


(A) Trajectory of the ray inside the medium is parabola
(B) Trajectory of the ray inside the medium is straight line
(C) The time taken by the ray to cross the medium is $\frac{2\mu_0 D}{c}$, where c is speed of light in vacuum.
(D) Equivalent optical path length of medium along trajectory of the ray is $2\mu_0 D$.

6. A small bead (A) of mass m = 2kg can slide without friction on a fixed horizontal rod, which is led through a diametric hole across the ball. There is another ball (B) of same mass attached to the first ball by a thin ideal string of length L = 1.6 m. Initially the balls are at rest, the thread is horizontally stretched to its length and is passing through the rod as shown in the figure. Then the ball B is released with zero initial velocity. Consider the instant when the thread becomes vertical and bead A is about to leave the rod. Their speeds and accelerations at this instant are v_A, v_B and a_A, a_B respectively. The force by rod on A is F and the tension in the string is T at this instant (take g = 10 m/s^2).

(A) $v_A/v_B = 1$ and $a_B = 20$ m/s^2
(B) $v_B = 4$ m/s and $a_B = 10$ m/s^2
(C) $v_A = 0$ and T = F
(D) $v_A = 4$ m/s and F/T = 3/2

7. A pendulum has conducting bob of mass m and conducting string of length ℓ. Pendulum is rotating freely about vertical axis OA with uniform angular speed ω in uniform vertical magnetic field $\vec{B} = B\hat{j}$ such that bob always touches the smooth conducting hemi-spherical surface centred at O as shown in the figure. Choose the correct option(s) (given ω = 5 rad/s, ℓ = 0.8 m, g = 10 m/s^2, B = 0.5 T)

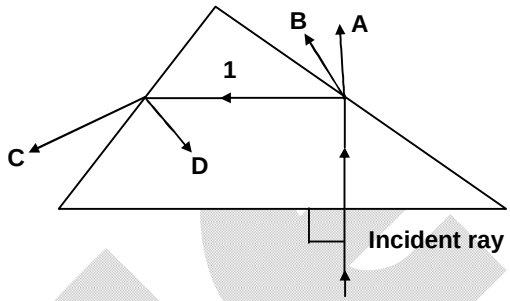


(A) $\alpha = 30°$
(B) $\alpha = 60°$
(C) V = 0.60 Volt
(D) V = 0.80 Volt

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 white light ray is incident on the base of a glass prism, and it creates four refracted rays A, B, C and D. Match the refracted rays with the colours given (1 and D are rays due to total internal reflection):

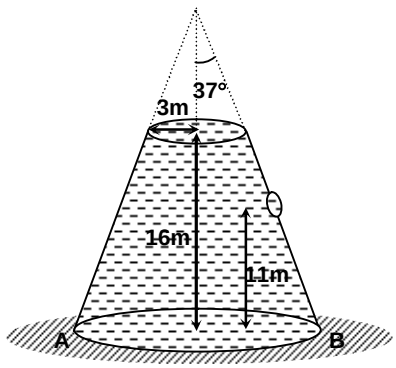


List –I		List –II	
(P)	A	(1)	Red
(Q)	B	(2)	Green
(R)	C	(3)	Yellow
(S)	D	(4)	Blue
		(5)	White

The correct option is:

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

9. Curved surface of a vessel shape of a truncated cone having semi-vertex angle 37°. Vessel is filled with water upto height of 16 m and is placed on a horizontal plane. Upper surface is opened to atmosphere. A very small hole is made on curved wall at a height of 11 m from bottom as shown in the figure. Area of water surface in the vessel is large as compared to the area of the hole. (take g = 10 m/s^2, density of waver = 1000 kg/m^3, area of hole = 0.5 cm^2 and sin 37° = 3/5)



List –I		List –II (S.I. unit)	
(P)	Initial velocity of efflux (in m/s)	(1)	18.70
(Q)	Distance (in meter) of the water (coming out from the hole just after opening the hole) where it strikes the horizontal surface from the point B, is	(2)	3
(R)	The horizontal force (in newton) exerted by the water coming out from the hole (just after opening the hole) on the container, is	(3)	4
(S)	The vertical force (in newton) exerted by the water coming out from the hole (just after opening the hole) on the container, is	(4)	9.35
		(5)	10

The correct option is:

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

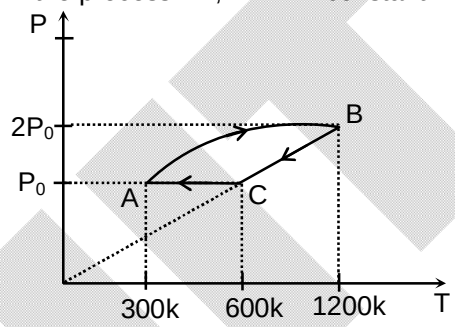
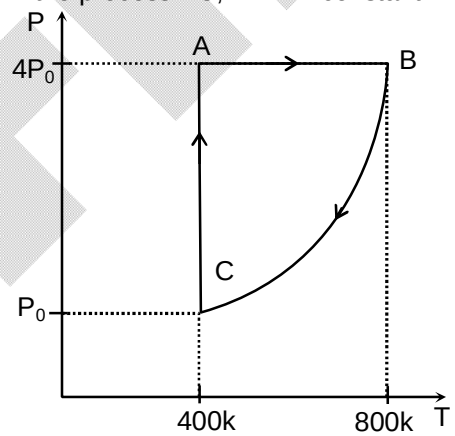
10. Match the following Columns

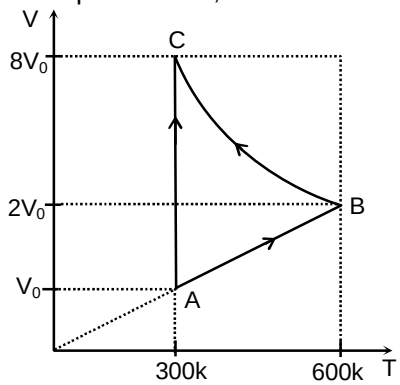
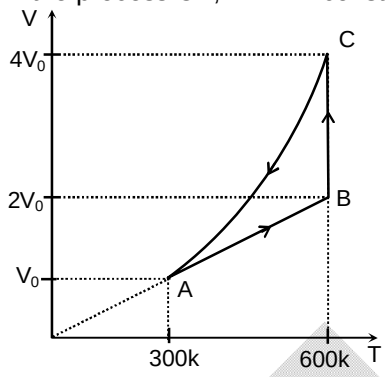
List –I		List –II	
(P)	Boltzmann constant	(1)	$[ML^2T^{-1}]$
(Q)	Coefficient of viscosity	(2)	$[ML^{-1}T^{-1}]$
(R)	Planck constant	(3)	$[MLT^{-3}K^{-1}]$
(S)	Thermal conductivity	(4)	$[ML^2T^{-2}K^{-1}]$
		(5)	$[ML^3T^{-2}K^{-2}]$

The correct option is:

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

11. Two moles of an ideal monoatomic gas is taken through four different cyclic processes as depicted in the List-I and List-II gives the total work done by the gas during each cyclic process. (Take $\ell n2 = 0.7$)

List –I		List –II	
(P)	In the process AB, $PT^{-\frac{1}{2}} = \text{constant}$ 	(1)	480 R
(Q)	In the process BC, $PT^{-2} = \text{constant}$ 	(2)	240 R

(R)	In the process BC, $VT^2 = \text{constant}$ 	(3)	600 R
(S)	In the process CA, $VT^{-2} = \text{constant}$ 	(4)	540 R
		(5)	300 R

The correct option is:

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

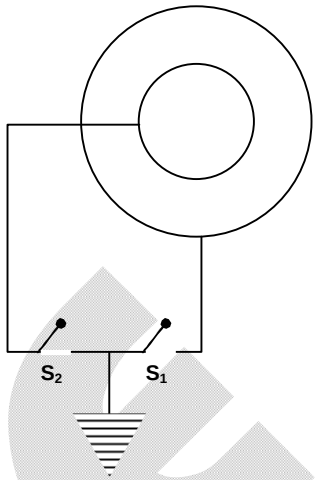
SECTION – B

(Numerical Answer Type)

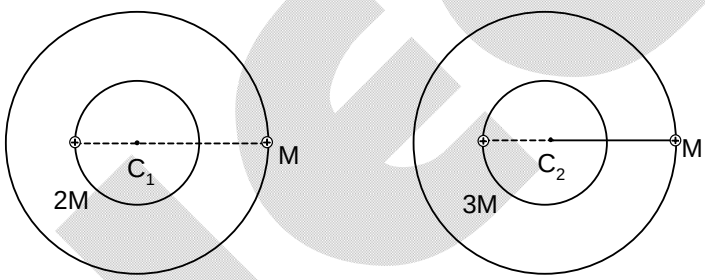
*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

12. A thin uniform rod of mass 6 kg is pushed at lowest point along a rough horizontal plane by a constant horizontal force F = 80 N. The rod is in the pure translational motion and making an angle θ from the vertical. If angle θ in degree is 5k (coefficient of friction $\mu = \frac{1}{3}$, rod is in the vertical plane). Find the value of k.

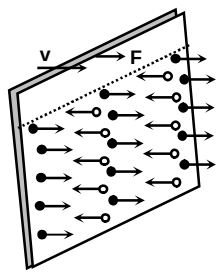
13. Two concentric conducting shells of radii R and 2R are shown in the figure. Initially a charge q is imparted to the inner shell. Let the potential difference between the cells is 10V. The switches S_1 and S_2 are alternatively closed 3 times each. After this if the magnitude of potential difference between the shells is $\frac{n}{4}$ volts, find the value of n. (Note that finally the switch S_2 is closed)



14. Figure shows two binary star systems such that the distance of lighter star from the centre of rotation is same in both cases. If the ratio of time periods of rotation is $\frac{T_1}{T_2} = \frac{n}{8}\sqrt{\frac{3}{2}}$, where n is an integer, find n.

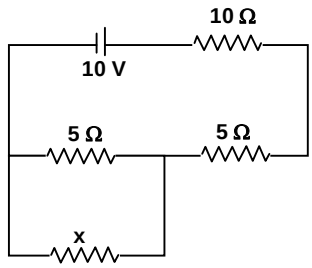


15. A thin heavy metal plate is being bombarded by a perpendicular beam of gas particles from both sides as shown in the figure. The solid dots are representing the molecules hitting from left side and the faint dots are the molecules hitting from right side. The mass of these gas particles is m = 10^{-26} kg and velocity before hitting is v_0 = 5 m/s. Volume density of the gas particles on both sides is n = 10^{25} per m^3. Each beam has an area A = 1 m^2 and the collisions are perfectly elastic. What is the external force F (in newton) required to move the plate with a constant velocity v = 2 m/s.



16. A current I flows through a thin cylinder of radius R. If the pressure exerted on the cylinder due to the flow of current will be $\frac{\mu_0 I^2}{2k\pi^2R^2}$, find the value of k.

17. Figure shows a battery circuit with an unknown resistance x. If the value of x for maximum power dissipation in unknown resistance is $\frac{15}{n}\Omega$ (n is an integer); find n.



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 maximum limiting labelling of oleum is approximately?
(A) 200% (B) 163.5%
(C) 122.5% (D) 180%

19. $A \xrightarrow[\substack{873\ K\\(\text{cyclic polymerisation})}]{\text{Red hot iron tube}} B \xrightarrow[\text{mixture}]{\text{nitrating}} C \xrightarrow[6[H]]{Sn+HCl} D \xrightarrow[\text{catalyst}]{3Br_2} E \xrightarrow[\text{Low temperature}]{NaNO_2+HCl} F \xrightarrow[H_2O]{H_3PO_2} G$

$\begin{pmatrix} C\% = 22.848 \\ H\% = 0.952 \\ Br\% = 76.20 \end{pmatrix}$

Molar mass of G is
(A) 240 (B) 300
(C) 315 (D) 205

20. Which one of the following statement is incorrect?
(A) In PF_5 the fluorine atoms are indistinguishable by means of spectroscopy
(B) The exchange of fluorine atoms in PF_5 is too rapid
(C) The two TBP arrangements are related to each other by simple rotation, the entire process is called inversion reaction
(D) In PF_5 ground state TBP is converted into SP transition state and back to new TBP structure

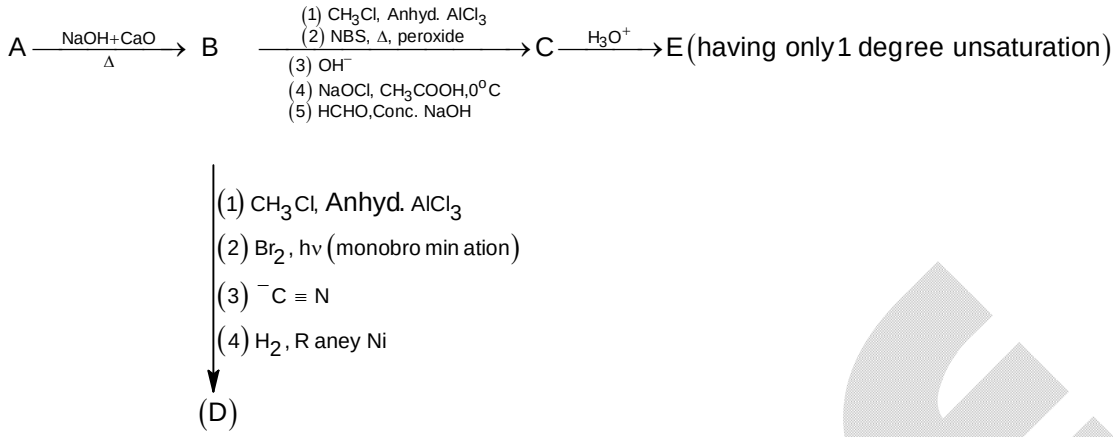
21. If one mole of a ideal gas $\left(C_P = \frac{5R}{2}\right)$ is expanded isothermally at 300 K until its volume is tripled and $P_{ext} = 0$ then which one of the following option is correct?
(A) $W \neq 0 \quad \Delta S = \text{infinity}$ (B) $W = 0 \quad \Delta S = R\ell n3$
(C) $\Delta E = 0 \quad \Delta S = 0$ (D) $\Delta E = 0 \quad \Delta S = \text{infinity}$

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. Which of the following option is/are correct?
(A) $Li < Na < K < Rb < Cs$ (Density)
(B) $Li < Na < K < Rb < Cs$ (Reactivity toward water)
(C) $Li < Na < I^- < Ag$ (Reducing strength in aqueous phase)
(D) $Cs^+ < Rb^+ < K^+ < Na^+ < Li^+$ (Hydration enthalpy)

23.



Select the correct option for above information
(A) E gives positive Tollen's test
(B) D gives positive carbyl amine test
(C) A and C are same compound
(D) C is one of the product of self Cannizzaro of HCHO

24. Select the correct option
(A) VO_4^{3-}, CrO_4^{2-} and MnO_4^- are isoelectronic ions
(B) VO_4^{3-}, CrO_4^{2-} and MnO_4^- have intense charge transfer transition
(C) MnO_4^- is intensely purple due to LMCT
(D) $VO_4^{3-} < CrO_4^{2-} < MnO_4^-$ (wavelength of charge transfer transition)

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. List – I contains complexes and List – II contains type of hybridisation of central atom and properties of complexes.

List – I		List – II	
(P)	$[FeF_6]^{3-}$	(1)	dsp^2
(Q)	$[NiCl_4]^{2-}$	(2)	sp^3d^2
(R)	$[Ni(CN)_4]^{2-}$	(3)	sp^3
(S)	$[CoF_6]^{3-}$	(4)	Diamagnetic
		(5)	Paramagnetic

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

26. List – I contains reaction and List – II contains product of reaction

List – I		List – II	
(P)	$P_4O_{10} + HNO_3 \longrightarrow$	(1)	NO_2
(Q)	$Pb(NO_3)_2 \xrightarrow{\Delta}$	(2)	NO
(R)	$NaNO_2 + FeSO_4 + H_2SO_4 \longrightarrow$	(3)	N_2O_5
(S)	$NH_4NO_3 \xrightarrow{\Delta}$	(4)	N_2O_3
		(5)	N_2O

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

27. List – I contains reactions and List – II contains colour of the precipitate formed in the reaction gives in List – I:

List – I		List – II	
(P)	$Cu(NO_3)_2 + K_4[Fe(CN)_6] \longrightarrow$	(1)	Black ppt.
(Q)	$Pb(NO_3)_2 + K_2CrO_4 \longrightarrow$	(2)	Yellow ppt.
(R)	$BiCl_3 + H_2O \longrightarrow$	(3)	Green ppt.
(S)	$Pb(CH_3COO)_2 + H_2S \longrightarrow$	(4)	White ppt.
		(5)	Chocolate brown ppt.

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

28. List – I contains reactions and List – II contains products of the reaction in List – I:

List – I		List – II	
(P)	$H_3C-\overset{\overset{O}{\|\|}}{C}-CH_3 \xrightarrow{CF_3CO_3H}$	(1)	$H_3C-\overset{\overset{NH}{\|\|}}{C}-CH_3$
(Q)	$H_3C-\overset{\overset{O}{\|\|}}{C}-CH_3 \xrightarrow{Ph_3\overset{+}{P}-\overset{-}{C}H_2}$	(2)	$H_3C-CH_2-CH_3$
(R)	$H_3C-\overset{\overset{O}{\|\|}}{C}-CH_3 \xrightarrow[(ii)\ KOH]{(i)\ NH_2-NH_2}$	(3)	$H_3C-\overset{\overset{CH_2}{\|\|}}{C}-CH_3$
(S)	$H_3C-\overset{\overset{O}{\|\|}}{C}-CH_3 \xrightarrow[H_3O^+]{LiAlH_4}$	(4)	$H_3C-\overset{\overset{O}{\|\|}}{C}-O-CH_3$
		(5)	$H_3C-\overset{\overset{OH}{\|}}{CH}-CH_3$

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

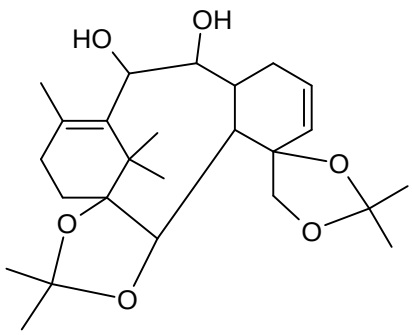
SECTION – B

(Numerical Answer Type)

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

29. Which of the following basic radicals give/s white precipitate with NaOH?
Pb^{2+}, Hg_2^{2+}, Ag^+, Bi^{3+}, Cu^{2+}, Cd^{2+}, Sb^{3+}, Ni^{2+}, Mn^{2+}, Fe^{3+}

30.



(X)

Degree of unsaturation in 'X' is equal to a; and if $b = \frac{a \times 10}{2}$. Then what is the value of b?

31. Which of the following are negatively charged sol?
Methylene blue, TiO_2, As_2S_3, CdS, Eosin, Congo red, Gelatin, Starch, Sb_2S_3

32. For the parallel chain reaction the rate of formation of B is 50% of rate of decay of A and rate of formation of C is 40% of rate of decay of A, what will be the partial half-life of A in hrs. while it is converting into D (Given that A parallelly gives B, C and D and overall half-life of A is 150 hrs.

33. A metal block of 270 gram having total heat capacity 566 JK^{-1} at 100^oC is placed in a lake at 10^0C. Calculate entropy change of lake $(\ell n 1.317 = 0.276)$

34. 36 ml of an aqueous solution of KCl was found to require 20 ml of 1 M $AgNO_3$ solution. When titrated using a suitable indicator. Depression in freezing point of KCl solution with 80% ionization will be: $(K_f = 2\ Kkg\ mol^{-1}$ and molarity = molality$)$

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 $f(x)$ be a differential function such that $f^2(x)+xf(x)=3$, then $\int \frac{3x^3+6x^2f(x)+2f(x)}{(2f(x)+x)\left(x^3-2f(x)\right)^2}dx$ is equal to

(A) $\frac{1}{x^3-2f(x)}+c$ (B) $\frac{1}{2f(x)-x^3}+c$

(C) $\frac{1}{2f(x)+x}+c$ (D) $\frac{1}{x^3+2f(x)}+c$

36. A gambler has one rupee in his pocket. He tosses an unbiased normal coin unless either he is ruined or unless the coin has been tossed for a maximum of five times. If for each head he wins a rupee and for each tail he looses a rupee, then the probability that the gambler is ruined is

(A) $\frac{1}{2}$ (B) $\frac{5}{8}$

(C) $\frac{3}{8}$ (D) $\frac{22}{32}$

37. If the quadratic equation $(2m+1)x^2+(2n+1)x+(2p+1)=0$, where $m,n,p\in I$, has real roots then both roots are

(A) Rational (B) Irrational

(C) Positive (D) Can't say

38. If $\int_0^1 \frac{\sin(\ln xt)}{\ln x}dx$ is equal to

(A) $\frac{\pi}{4}$ (B) $\frac{11}{14}$

(C) $\frac{\pi}{4}-\frac{11}{14}$ (D) $\frac{22}{7}-\pi$

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. In a ΔABC, if all angles are less than $\frac{2\pi}{3}$ and $S=\frac{\cos A+\cos B-\cos C}{\sin A+\sin B-\sin C}$, then which of the following values of S is/are possible

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

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

40. Consider a pyramid built on a square base of side 2 such that the lengths of the line segments joining its apex to the 4 corners of the base are equal and the height of the structure is equal to the length of a side of its base. Then which of the following statements is/are true

(A) volume of the pyramid is $\frac{8}{3}$

(B) the angle between the base and any other face is $\sin^{-1}\frac{2}{\sqrt{5}}$

(C) the angle between two faces with common edge which passes through the apex is $\cos^{-1}\frac{1}{5}$

(D) volume of the largest tetrahedron that can be inscribed in the pyramid is 1

41. Consider the function $F(x)=\int_1^n \frac{x^u}{u}du$ (n > 1), then which of the following statements is/are true

(A) F(x) has a local maxima at x = 2

(B) $\lim_{x\to 1^+} F(x)=0$

(C) $\lim_{x\to 1} F(x)=\ln n$

(D) $\lim_{x\to 1^+} F(x)=\ln n$

SECTION – A
(Matching List Type)

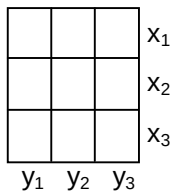
*This section contains **FOUR (04)** Matching List Type Questions. Each question has FOUR statements in **List-I** entries (P), (Q), (R) and (S) and FIVE statements in **List-II** entries (1), (2), (3), (4) and (5). The codes for lists have choices (A), (B), (C), (D) out of which **ONLY ONE** of these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

42. Let A and B are points on the line L_1, L_2 respectively such that d = OA + OB + AB is minimum (O being the origin), match the following List-I with List-II

List - I		List - II	
(P)	$L_1: x-1=y-1=\frac{z+1}{0}$, $L_2: x+2=4-y=\frac{z+1}{0}$	(1)	$d=4\sqrt{2}$
(Q)	$L_1: \frac{x-1}{2}=1-y=1-z$, $L_2: x-2=y-2=\frac{2-z}{2}$	(2)	$d=2\sqrt{3}$
(R)	$L_1: x=y=z-\sqrt{2}$, $L_2: x=y=z+\sqrt{2}$	(3)	$d=6\sqrt{2}$
(S)	$L_1: 2x-3=6-y=\frac{z}{0}$, $L_2: x+3=2y=\frac{z}{0}$	(4)	$d=4\sqrt{3}$
		(5)	

The correct option is:
(A) (P) → (1); (Q) → (4); (R) → (2); (S) → (3)
(B) (P) → (2); (Q) → (4); (R) → (1); (S) → (3)
(C) (P) → (2); (Q) → (4); (R) → (3); (S) → (1)
(D) (P) → (4); (Q) → (1); (R) → (2); (S) → (3)

43. Let every cell of adjoining 3 × 3 array is filled by natural number such that $x_1x_2x_3 = y_1y_2y_3 = 2^3 3^4 5^7$ where x_i, y_j are product of numbers filled in three cells of i^{th} row and j^{th} column respectively i, j ∈ {1, 2, 3}, match the following List-I with List-II



List – I (Condition on x_i, y_i)		List – II (Number of filling the array)	
(P)	If x_i as well as y_j are divisible by 2 for every i, j $\in$ {1, 2, 3}	(1)	$3\cdot{}^{11}C_3({}^{9}C_2\cdot{}^{9}C_5 + {}^{12}C_5\cdot{}^{6}C_2 - 2\cdot{}^{9}C_2\cdot{}^{6}C_2)$
(Q)	If none of y_i (i = 1, 2, 3) is divisible by 27	(2)	$(3!\cdot{}^{12}C_4\cdot{}^{15}C_8)$
(R)	If none of x_i (i = 1, 2, 3) is divisible by 15	(3)	$2\cdot3^5\cdot{}^{11}C_3\cdot{}^{15}C_7$
(S)	If exactly two cells are assigned the value 1 and all other cells have number divisible by 5	(4)	$({}^{9}C_6\cdot{}^{10}C_6){}^{9}C_2$
		(5)	

The correct option is:
(A) (P) → (2); (Q) → (1); (R) → (3); (S) → (4)
(B) (P) → (4); (Q) → (3); (R) → (1); (S) → (2)
(C) (P) → (3); (Q) → (1); (R) → (4); (S) → (2)
(D) (P) → (2); (Q) → (3); (R) → (1); (S) → (4)

44. The equation $x^2 - a = \sqrt{x+a}$ has real or imaginary roots depending on values of a. List-I represents the nature of root and List-II represents the corresponding exhaustive values of a, match the following List-I with List-II

List–I		List–II	
(P)	No real root	(1)	$(0,1)\cup\left\{-\frac{1}{4}\right\}$
(Q)	One real root	(2)	$\left(-\infty,-\frac{1}{4}\right)$
(R)	Exactly two real roots	(3)	$\left(-\frac{1}{4},0\right]\cup[1,\infty)$
(S)	Atleast two real roots	(4)	$\left(0,\frac{3}{4}\right)\cup\left\{-\frac{1}{4}\right\}$
		(5)	$\left(-\frac{1}{4},0\right]\cup\left[\frac{3}{4},\infty\right)$

The correct option is:
(A) (P) → (2); (Q) → (1); (R) → (3); (S) → (3)
(B) (P) → (2); (Q) → (1); (R) → (5); (S) → (4)
(C) (P) → (1); (Q) → (4); (R) → (5); (S) → (5)
(D) (P) → (2); (Q) → (4); (R) → (5); (S) → (5)

45. Match the following List-I with List-II

List – I		List - II	
(P)	The value of ${}^{50}C_{10} + {}^{49}C_{10} + {}^{48}C_{10} + ... + {}^{10}C_{10}$ is	(1)	$2^{100} - 1$
(Q)	The value of ${}^{50}C_1 + {}^{50}C_2 + {}^{50}C_3 + ... + {}^{50}C_{49}$ is	(2)	${}^{53}C_{10}$
(R)	The value of ${}^{50}C_{10} + 3\cdot{}^{50}C_9 + 3\cdot{}^{50}C_8 + {}^{50}C_7$ is	(3)	$2^{50} - 2$
(S)	The value of ${}^{50}C_{10} + 4\cdot{}^{50}C_9 + 6\cdot{}^{50}C_8 + 4\cdot{}^{50}C_7 + {}^{50}C_6$ is	(4)	${}^{51}C_{11}$
		(5)	${}^{54}C_{10}$

The correct option is:
(A) (P) → (2); (Q) → (4); (R) → (3); (S) → (1) (B) (P) → (4); (Q) → (3); (R) → (2); (S) → (5)
(C) (P) → (4); (Q) → (3); (R) → (1); (S) → (5) (D) (P) → (2); (Q) → (3); (R) → (4); (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. Number of real solution(s) of the equation $6^x + 1 = 8^x - 27^{x-1}$ is equal to

47. Let A be a 3×3 orthogonal matrix and λ be a non-zero, real number such that $|\text{adj}(\text{adj } \lambda A)| = 16|\text{adj } \lambda A|$, then $[\lambda^2]$ is equal to (where [.] denotes the greatest integer function)

48. Let $L = \int_0^1 \lim_{n\to\infty} \sum_{k=0}^{n} \frac{x^{k+1}3^k}{k!} dx$, then $\left[\ln \frac{9}{2} L\right]$ is equal to (where [.] denotes the greatest integer function)

49. Let (x, y) be a pair of real numbers satisfying $56x + 33y = \frac{-y}{x^2+y^2}$ and $33x - 56y = \frac{x}{x^2+y^2}$. If $|x| + |y| = \frac{p}{q}$ (where p and q are relatively prime), then (6p – q) is

50. The equation $x^4 + ax^3 + bx^2 + ax + 1 = 0$ has atleast one real root and if the minimum value of $E(a, b) = a^2 + b^2$ can be expressed as $\frac{p}{q}$ (p and q are relatively prime), then $(p^2 + q^2)$ is

51. Let $\Delta = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$, where D_1, D_2, D_3 are cofactors of c_1, c_2 and c_3 respectively such that $D_1^2 + D_2^2 + D_3^2 = 16$ and $c_1^2 + c_2^2 + c_3^2 = 4$, then maximum value of Δ is