FIITJEE

ALL INDIA TEST SERIES

JEE (Advanced)-2025

CONCEPT RECAPITULATION TEST – III

PAPER –1

TEST DATE: 24-04-2025

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

General Instructions:

- The test consists of total 54 questions.
- Each subject (PCM) has 18 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 –06, 19 – 24, 37 – 42):* This section contains **EIGHTEEN (18)** questions. Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

Section – A *(07 – 10, 25 – 28, 43 – 46):* This section contains **TWELVE (12)** Matching List Type Questions. Each question has **FOUR** statements in **List-I** entries (I), (II), (III) and (IV) and **FIVE** statements in **List-II** entries (P), (Q), (R), (S) and (T). The codes for lists have choices (A), (B), (C), (D) out of which, **ONLY ONE** of these four options is correct answer.

Section – B *(11 – 18, 29 – 36, 47 – 54):* This section contains **TWENTY FOUR (24)** numerical based questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.

MARKING SCHEME

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

Full Marks	:	+3	If ONLY the correct numerical value is entered at the designated place;
Zero Marks	:	0	In all other cases.

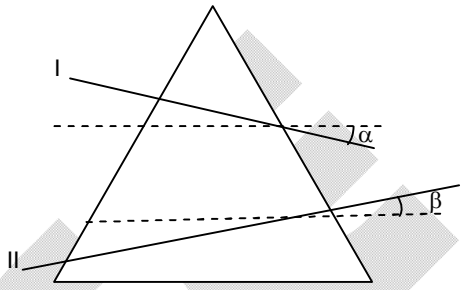
Physics

PART – I

Section – A (Maximum Marks: 24)

*This section contains **SIX (06)** 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).*

1. There is a triangular wedge as shown in the figure. There are two imaginary planes that divide the wedge into three portions. Let α and β be the inclination of these two planes with respect to the horizontal as shown in the figure. The two portion of the wedge divided by plane I are having reaction vector $\vec{R}_1$, similarly reaction vector between two portion divided by plane II is $\vec{R}_2$

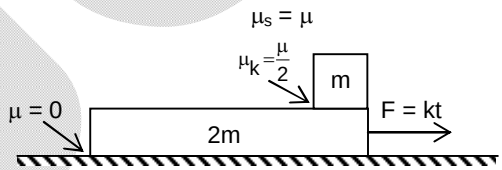


What are the possible angles between $\vec{R}_1$ and $\vec{R}_2$

(A) 0 (B) $\frac{\pi}{2}+\beta$

(C) $\alpha+\beta$ (D) π

2 Figure shows a plank with a block placed on it. There exists friction between plank and block but horizontal surface on which plank moves is smooth. A variable force which grows with time is applied on plank as shown

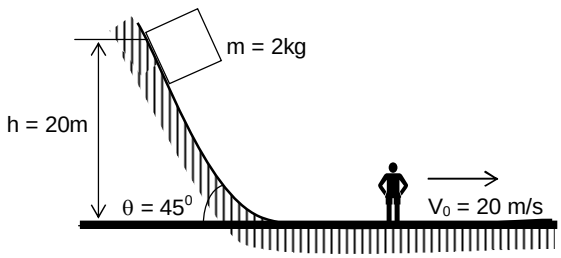


It was observed that at time $t = t_0$ relative slipping between block and plank starts and at $t = 2t_0$, block separates from plank. Speed of block at this instant as observed from frame of plank is

(A) $2\frac{\mu^2 mg^2}{k}$ towards left (B) $\frac{3\mu^2 mg^2}{k}$ towards left

(C) $\frac{9\mu^2 mg^2}{2k}$ towards left (D) None of these

3. A block of mass m is released from top of an inclined plane of inclination $\theta = 45^0$ as shown in the figure. An observer is moving on the horizontal floor with constant velocity 20 m/s as shown, when the block reaches to horizontal floor.



All surfaces are smooth
take $g = 10 m/s^2$

(A) Velocity observed by observer will be 20 m/s
(B) Change in kinetic energy of the block will be 400J as observed by observer
(C) Work energy theorem is not applicable in moving observer frame
(D) Work done by normal reaction is – 800 J as observed by the observer

4. In the series L – C – R circuit, the voltage across resistance, capacitance and inductance are 30V each at frequency $f = f_0$.

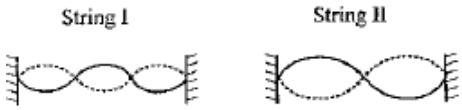
(A) It the inductor is short-circuited, the voltage across the capacitor will be $30\sqrt{2}$ V.

(B) If the capacitor is short-circuited, the voltage drop across the inductor will be $\frac{30}{\sqrt{2}}$ V.

(C) If the frequency is changed to $2f_0$, the ratio of reactance of the inductor to that of the capacitor is 4 : 1.

(D) If the frequency is changed to $2f_0$, the ratio of the reactance of the inductor to that of the capacitor is 1 : 4.

5. String I and II have identical lengths and linear mass densities, but string I is under greater tension than string II. The accompanying figure shows four different situations, A to D, in which standing wave patterns exist on the two strings. In which situation is it possible that strings I and II are oscillating at the same resonant frequency?

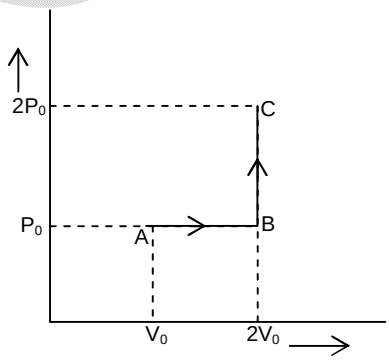
(A) 

(B) 

(C) 

(D) 

6 One mole of an ideal monoatomic gas is taken from A to C along the path ABC. The temperature of the gas at A is T_0. For the process ABC (where R is gas constant)



(A) Heat absorbed by the gas is $\frac{11}{12}RT_0$

(B) Heat absorbed by the gas is $\frac{11}{2}RT_0$

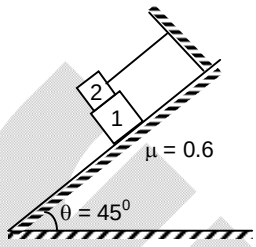
(C) Work done by the gas = RT_0

(D) Change in internal energy of gas is $\frac{9}{2}RT_0$

Section – A (Maximum Marks: 12)

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

7. Two block of masses m_1 = 1 kg & m_2 = 1 kg is lying on rough inclined plane as shown in the figure then Match the following



List – I		List - II	
(I)	Magnitude of friction force acting between blocks 1 & 2 (in N)	(P)	$3\sqrt{2}$
(II)	Tension is String (in N)	(Q)	0.4
(III)	Coefficient of static friction force between blocks 1 & 2	(R)	$7\sqrt{2}$
(IV)	Magnitude of friction force acting between block 1 & incline plane (in N)	(S)	$2\sqrt{2}$
		(T)	Can not be determined

The correct option is:

(A) I → S, II → R, III → P, IV → T (B) I → S, II → R, III → T, IV → P

(C) I → S, II → P, III → T, IV → R (D) I → S, II → R, III → T, IV → Q

8. m gram of water at 50°C is mixed with M gram ice at -20°C in an adiabatic vessel. Assume heat exchange between water and ice only. The system is left for long time and its final temperature written in list–II specific heat of water and ice are 1 & 0.5 cal/g-k. and latent heat of fusion for ice is 80 cal/g

List–I		List–II	
(I)	m =100 gm M = 100 gm	(P)	26.66°C
(II)	m =100 gm M = 20 gm	(Q)	0°C
(III)	m =10 gm M = 200 gm	(R)	3.33°C
(IV)	m =200 gm M = 100 gm	(S)	6.67°C
		(T)	–6.36°C

The correct option is:

(A) I → Q, II → P, III → T, IV → R (B) I → Q, II → T, III → R, IV → P

(C) I → Q, II → P, III → S, IV → T (D) I → S, II → R, III → T, IV → Q

9. The second overtone of an open organ pipe A and a closed pipe B have the same frequency at a given temperature. It follows that the ratio of the

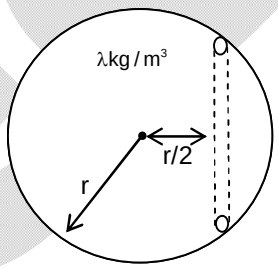
List–I		List–II	
(I)	Length of A and B is	(P)	9 : 10
(II)	Fundamental frequencies of A & B is	(Q)	5 : 3
(III)	First overtone of A to third harmonic of B is	(R)	10 : 9
(IV)	Time period of first overtone of A & B is	(S)	6 : 5
		(T)	None of these

The correct option is:

(A) I $\rightarrow$ S, II $\rightarrow$ Q, III $\rightarrow$ T, IV $\rightarrow$ R (B) I $\rightarrow$ Q, II $\rightarrow$ T, III $\rightarrow$ S, IV $\rightarrow$ R

(C) I $\rightarrow$ S, II $\rightarrow$ Q, III $\rightarrow$ R, IV $\rightarrow$ P (D) I $\rightarrow$ S, II $\rightarrow$ Q, III $\rightarrow$ P, IV $\rightarrow$ T

10. Consider a planet of radius r having density λ. A tunnel is dug inside it at a distance r/2 from its centre as shown. An object of mass m is left in the tunnel at the surface at t = 0 then



	List-I		List-II
(I)	Time taken by the object to reach the mid of the tunnel	(P)	Zero
(II)	Magnitude of velocity of object at the centre of the tunnel	(Q)	g
(III)	Normal reaction applied by wall of the tunnel on the object	(R)	$\sqrt{\frac{3\pi}{16G\lambda}}$
(IV)	Acceleration of object when it reach the mid of the tunnel	(S)	$\frac{2}{3}\pi G\lambda r\,m$
		(T)	$\left(\sqrt{\pi 6\lambda}\right) r$

The correct option is:

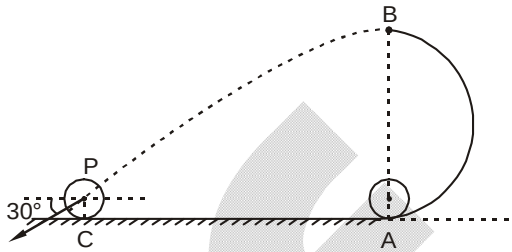
(A) I $\rightarrow$ R, II $\rightarrow$ T, III $\rightarrow$ Q, IV $\rightarrow$ S (B) I $\rightarrow$ R, II $\rightarrow$ T, III $\rightarrow$ S, IV $\rightarrow$ P

(C) I $\rightarrow$ R, II $\rightarrow$ P, III $\rightarrow$ T, IV $\rightarrow$ Q (D) I $\rightarrow$ R, II $\rightarrow$ Q, III $\rightarrow$ S, IV $\rightarrow$ T

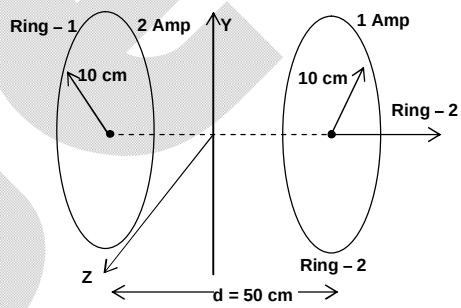
Section – B (Maximum Marks: 24)

*This section contains **EIGHT (08)** numerical based questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.*

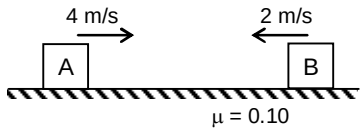
11. A disc radius r = 0.1 m is rolled without sliding from a point A on a track as shown in the figure. The part AB of the track is a semi-circle of radius R in a verticals plane. The disc leaves contact with the track at its highest point B and strikes the ground at point C. The velocity of the center of mass of the disc makes an angle of 30° below the horizontal at the time of striking the ground. At the same instant, velocity of the topmost point P of the disc is found to be 6 m/s. (Take g = 10 m/s^2). Determine the value of R.



12. Two co–axial rings of same radius R=10 cm are placed parallel to the y–z plane, such that x–axis of the rings .Ring 1 carries a current of 2 Amp and 2 carries a current of 1 Amp in opposite sense as shown in the figure .The separation between the rings is d = 50 cm .Find the magnitude of $\left(\int_{+\infty}^{-\infty} \vec{B}.d\vec{x}\right) X10^7$,where $\vec{B}$ is the net magnetic field due to both the rings at any point on the axis .

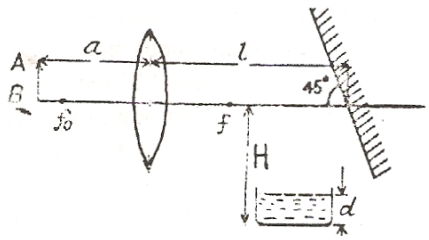


13. Block A and B each of mass 1 kg are moving with 4 m/sec and 2 M/sec respectively as shown. The coefficient of friction for all surfaces is 0.10. Find he distance by which centre of mass will travel before coming to rest (in m).

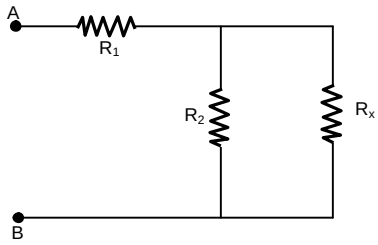


14. The time period of a simple pendulum is T. Now the bob is immersed in a liquid of density r.
It density of material of bob is ρ, the new time period of the pendulum is nT, find n. (take $\frac{r}{\rho}=\frac{1}{2}$)

15. An object AB is at a distance of a = 36 cm from a lens with a focal length of f = 30 cm. A flat mirror turned through 45^0 with respect to the optical axis of the lens is placed behind it at a distance l = 1m as shown in figure. To obtain a sharp image of the object on the bottom of a tray which contains water upto depth d = 20 cm, if value of distance H should be equal to

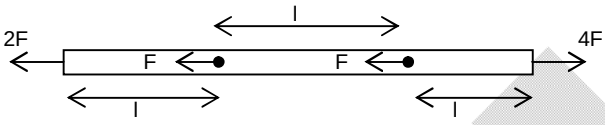


16. A circuit shown in figure has resistance R_1 & R_2. At what value of the resistance Rx will the thermal power generated in it be practically independent of small variations of that resistance? The voltage between the points A and B is supposed to be constant in this case (take $R_1 = 6, R_2 = 4$)



17. A transverse travelling wave represented by equation $y = a\sin(2\pi x - 20\pi t)$, where x is in meters and t is in seconds, is travelling on a string of mass per unit length 0.01 kg/m. Find the kinetic energy of a portion of the string of length equal to one wavelength.($a^2 = \frac{1}{\pi}$ unit)

18. Force acting on a uniform rod having length 3l & area of cross section A and young's modulus Y are shown in figure. Find elongation in the rod (take $\frac{Fl}{YA} = \frac{3}{4}$)



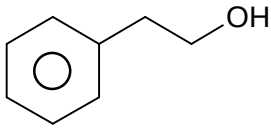
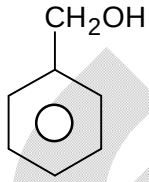
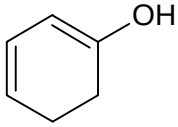
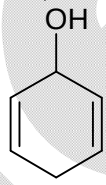
Chemistry

PART – II

Section – A (Maximum Marks: 24)

*This section contains **SIX (06)** 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).*

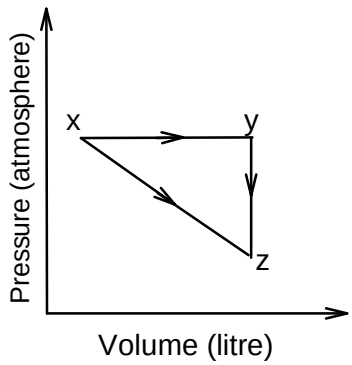
19. Which of the following compound produce any gas when reacts with water?
(A) KO_2 (B) CaC_2
(C) Mg_3N_2 (D) $Ba(NO_3)_2$

20. Which of the following compound does exhibit mesomeric effect?
(A) 
(B) 
(C) 
(D) 

21. The boiling point of which of the following aqueous solution(s) is/are greater than 100°C?
(A) 0.2 M NaCl (B) 0.1 M $AlCl_3$
(C) 1 M KNO_3 (D) 2 M $BeSO_4$

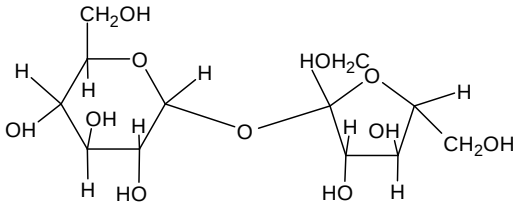
22. $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ K_p = 2 atm at 300 K
20 gram $CaCO_3$(solid) is heated in a closed container of volume 1 litre at 300 K. Which is/are the correct option(s)?
(A) On addition of small amount of $CaCO_3$, pressure of CO_2 will increase
(B) On increasing temperature, the decomposition of $CaCO_3$ becomes faster
(C) Amount of CaO should decrease on addition of $CaCO_3$.
(D) Equilibrium constant depends on temperature.

23 For an ideal gas, consider only P – V work in going from an initial state X to final state Z. The final state Z can be reached by either of the two paths shown in figure. Which of the following choice (s) is (are) correct? [Take ΔS as change is entropy ΔH change is enthalpy and W as work done]

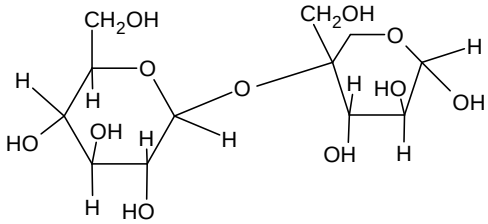


(A) $\Delta S_{x\to z} = \Delta S_{x\to y} + \Delta S_{y\to z}$
(B) $W_{x\to z} = W_{x\to y} + W_{y\to z}$
(C) $W_{x\to y\to z} = W_{x\to y}$
(D) $\Delta H_{x\to y\to z} = \Delta H_{x\to z}$

24. The correct statement(s) about the following sugars **X** and **Y** is(are)



X



Y

(A) X is a reducing sugar and Y is a non-reducing sugar
(B) X is a non-reducing sugar and Y is a reducing sugar
(C)The glucosidic linkages in X and Y are α and β respectively
(D) The glucosidic linkages in X and Y are β and α, respectively

Section – A (Maximum Marks: 12)

*This section contains **FOUR (04)** Matching List Type Questions. Each question has FOUR statements in **List-I** entries (I), (II), (III) and (IV) and FIVE statements in **List-II** entries (P), (Q), (R), (S) and (T). 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 radicals mentioned in list-I with their reactions mentioned in list-II & answer the following.

List – I		List – II	
(I)	Fe^{2+}	(P)	Forms precipitate with KCN, which is soluble in excess of the reagent.
(II)	Hg^{2+}	(Q)	Forms precipitate with NaOH and NH_4OH, which is insoluble in both excess of reagent.
(III)	Pb^{2+}	(R)	forms coloured precipitate with KI, which is soluble in excess of reagent.
(IV)	Ag^{+}	(S)	forms black precipitate with H_2S which is soluble in hot and dilute HNO_3.
		(T)	Forms red colouration with NaSCN

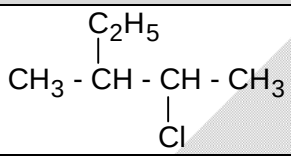
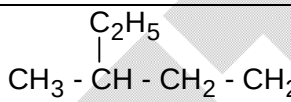
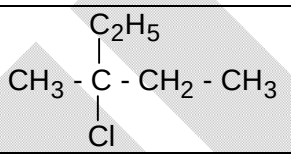
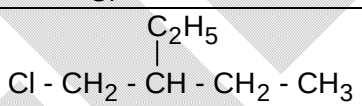
The correct combination out of the following is
(A) (I) $\rightarrow$ PQ, (II) $\rightarrow$ QR, (III) $\rightarrow$ RS, (IV) $\rightarrow$ PS
(B) (I) $\rightarrow$ PS, (II) $\rightarrow$ PQ, (III) $\rightarrow$ ST, (IV) $\rightarrow$ QS
(C) (I) $\rightarrow$ QS, (II) $\rightarrow$ PR, (III) $\rightarrow$ RS, (IV) $\rightarrow$ PQ
(D) (I) $\rightarrow$ ST, (II) $\rightarrow$ QR, (III) $\rightarrow$ PS, (IV) $\rightarrow$ PT

26. Match the aqueous solutions of acids, bases and salts mentioned in list-I with their pH and nature mentioned in list-II & answer the following.

List – I		List – II	
(I)	HCOOH (p^{K_a} = 3.74, 0.1 M) + HCOONa (0.1 M)	(P)	Acidic buffer at its maximum capacity
(II)	CH_3COOH (0.1 M) + HCl (0.1 M)	(Q)	behaves as a buffer
(III)	CH_3COOH (p^{K_a} = 4.74, 0.1 M) + NH_4OH (p^{K_a} = 9.26, 0.1 M)	(R)	pH < 7 at 298 K
(IV)	HCOONa (300 mL of 0.1 M) + HCl (100 mL of 0.1 M)	(S)	pH = 7 at 298 K
		(T)	pH > 7 at 298 K

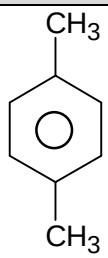
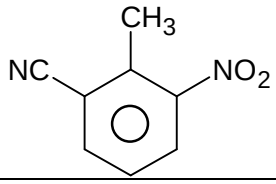
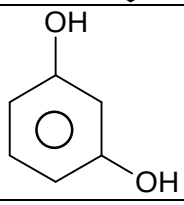
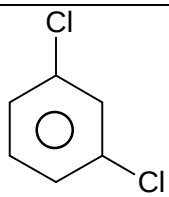
The correct combination out of the following is
(A) (I) → PQ, (II) → RST, (III) → RS, (IV) → PS
(B) (I) → PQR, (II) → R, (III) → QS, (IV) → QR
(C) (I) → QS, (II) → PRS, (III) → RS, (IV) → PQR
(D) (I) → PST, (II) → QR, (III) → ST, (IV) → PT

27. Match the alkyl chlorides mentioned in list-I with the nature of their elimination reactions and products mentioned in list- II & answer the following.

List – I		List – II	
(I)		(P)	One product shows geometrical isomerism if formed through E_2 mechanism
(II)		(Q)	One product shows geometrical isomerism if formed through E_1 mechanism
(III)		(R)	One product shows optical isomerism if formed through E_2 mechanism
(IV)		(S)	One product shows optical isomerism if produced through E_1 mechanism
		(T)	One product shows no geometrical isomerism if formed by E_1 or E_2

The correct combination out of the following is
(A) (I) → PQRS, (II) → QRS, (III) → PQ, (IV) → Q
(B) (I) → PQR, (II) → RST, (III) → PQRS, (IV) → QR
(C) (I) → QS, (II) → PRST, (III) → RS, (IV) → PQR
(D) (I) → PST, (II) → QRST, (III) → ST, (IV) → RT

28. Match the compounds mentioned in List-I with their properties mentioned in List-II & answer the following.

List – I		List – II	
(I)		(P)	Forms one monosubstituted product in electrophilic substitution reactions.
(II)		(Q)	Forms more than one monosubstituted product in electrophilic substitution reactions
(III)		(R)	More reactive than benzene towards EAS reaction
(IV)		(S)	Less reactive than benzene towards EAS reaction
		(T)	The substituents exert –I as well as +R effect

(A) (I) $\rightarrow$ PR, (II) $\rightarrow$ PS, (III) $\rightarrow$ QRT, (IV) $\rightarrow$ QST
(B) (I) $\rightarrow$ QST, (II) $\rightarrow$ RT, (III) $\rightarrow$ PQ, (IV) $\rightarrow$ PR
(C) (I) $\rightarrow$ Q, (II) $\rightarrow$ S, (III) $\rightarrow$ PR, (IV) $\rightarrow$ T
(D) (I) $\rightarrow$ ST, (II) $\rightarrow$ Q, (III) $\rightarrow$ T, (IV) $\rightarrow$ PT

Section – B (Maximum Marks: 24)

*This section contains **EIGHT (08)** numerical based questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.*

29. How many maximum number of nitro product(s) is/are formed when $CH_3CH_2CH_3$ reacts with fuming HNO_3?

30. An acid-base indicator has $K_a = 3 \times 10^{-5}$. The acid form of the indicator is red and the basic form of the indicator is blue. By how much must the pH change in order to change the indicator from 75% red to 75% blue? [log 3 = 0.4770]

31. 'X' is an aliphatic monocarboxylic acid. It is the simplest acid which can form only one alpha(α)-chloroproduct(Y), upon treatment with Cl_2 in presence of red phosphorus(H.V.Z reaction). What is the molar mass of Y in g mol^{-1} unit?

32. How many S – O single bonds are present in Caro's acid (H_2SO_5)?

33. What volume in mL of 0.5 M acidified potassium permanganate solution can completely oxidize 523.15×10^{-3} moles of Sn^{2+} ions to Sn^{4+} ions?
$MnO_4^- + Sn^{2+} + H^+ \longrightarrow Mn^{2+} + Sn^{4+} + H_2O$

34. In Na^+, Mg^{2+}, Al^{3+}, O^{2-}, F^-, Cl^- atoms. If x atoms have more radius as compared to Al^{3+} then find $\frac{x}{2}$?

35. Reaction of phenol(PhOH) with bromine water(Br_2/H_2O) forms a precipitate. What is the molar mass of the precipitate in g mol^{-1} unit?
[Molar mass of bromine = 79.9]

36. The radiator of a car contains 50.5 g water. If 6.2 g of glycol ($HOCH_2CH_2OH$) is added to it, the solution freezes at -4^oC. How many gram of ice will be separated in the process?
[K_f = 1.86 K kg mol^{-1}]

Mathematics

PART – III

Section – A (Maximum Marks: 24)

*This section contains **SIX (06)** 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).*

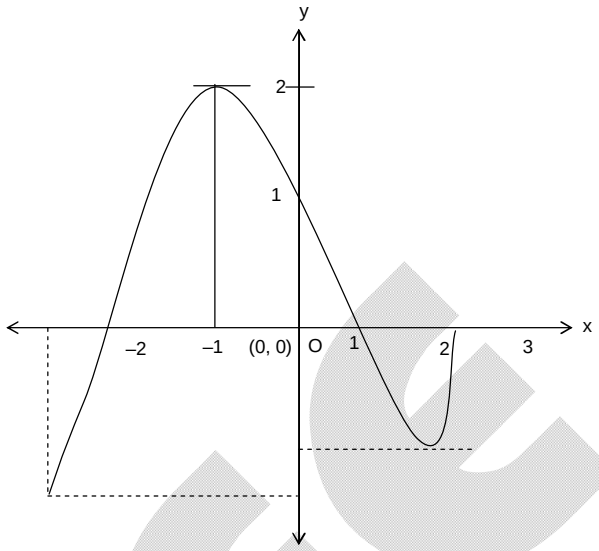
37. AB are non singular square matrices even order such that $A^T = A, B^T = -B$ and $AB + BA = 0$ then
(A) AB is symmetric matrix
(B) A^{-1} and B^{-1} commute each other
(C) A^{-1} and B^{-1} anticommute each other
(D) B^{-1} and A^{-1} anticommute each other

38. Let A be non singular, symmetric matrix of order 3 such that $A = \text{ajd}\left(A + A^T\right)$ then
(A) $16A^{-1} = A$
(B) $A^{-1} = 16A$
(C) $\text{adj}\left(A^{-1}\right) = 64A$
(D) $\text{adj}\left(A^{-1}\right) = \dfrac{A}{1024}$

39. Let $a_1, a_2, a_3 \ldots\ldots, a_n$ be a sequence of real numbers which satisfies the relation $a_{n+1} = \sqrt{a_n^2 + 1} \; \forall \; n \in N$. Suppose that there exists a positive integer n_0 such that $a_{2n_0} = 3a_{n_0}$, then?
(A) $\lim\limits_{n\to\infty} \dfrac{2a_n}{\sqrt{n + 2020}} = 2$
(B) If $T_r = \sum\limits_{n+1}^{n=r} a_n^2$, the $\min\left(T_1, T_2, \ldots\ldots T_r\right) = -1$
(C) $\lim\limits_{n\to\infty} \left(a_{n+1} + a_n\right) n^{-\frac{1}{2}} = 2$
(D) $\left[\dfrac{1}{2}\sum\limits_{n=1}^{49} \sqrt{\dfrac{8}{8a_n^2 + 7}}\right] = 6$, (where [.] denotes the greatest integer function)

40. A bug starts from the origin O (0, 0) in the co – ordinate plane jumping from one point to another at the rate of one jump per second. It moves according to the rule that from (m, n), it jumps to either (m, n + 1) or (m + 1, n), $(m, n \in W)$, either been equally likely. Five second from the start the bug reaches (α, β), then?
(A) the number of different values that $|\alpha - \beta|$ can take is 3
(B) probability that bug reaches (α, β) if $|\alpha - \beta| = 1$, is $\dfrac{10}{16}$
(C) probability that bug reaches (α, β) if $|\alpha - \beta| > 1$ is $\dfrac{1}{8}$
(D) probability that bug reaches (α, β) if $|\alpha - \beta| > 4$ is $\dfrac{1}{3}$

41. The figure illustrate graph of the function $y = f(x)$ defined in $[-3, 2]$. Identify the correct statement(s)?



(A) Range of $y = f(-|x|)$ is [–2, 2]

(B) Domain of $y = f(|x|)$ is $[-2, 2]$

(C) Domain of $y = f(|x|+1)$ is [–1, 1]

(D) Range of $y = f(|x|+1)$ is $[-1, 0]$

42. Let S = {1, 2, 3, 4,……..,n} and f_n be the number of those subsets of S which do not contain consecutive elements of S, then

(A) $f_n = \frac{n(n-1)(n-2)}{6}$

(B) $f_n = 2f_{n-1}$

(C) $f_n = f_{n-1} + f_{n-2}$

(D) $f_4 = 8$

Section – A (Maximum Marks: 12)

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

43. Observe the following list:

List–I		List-II	
(I)	If $\lvert a_i\rvert > 1;\ \lambda_i \geq 0$ for $i = 1,2,3,\ldots,n$ and $\lambda_1 + \lambda_2 + \ldots + \lambda_n = 1$ and ω is a complex cube root of unity, then $\lvert\lambda_1 a_1\omega + \lambda_2 a_2\omega^2 + \ldots + \lambda_n a_n\omega^n\rvert$ cannot exceed	(P)	$\lvert z\rvert^n + \frac{1}{\lvert z\rvert}N$
(II)	If $\mathrm{Re}(z) < 0$, then the value of $(1 + z + z^2 + \ldots + z^n)$ cannot exceed	(Q)	2
(III)	If $\omega(\neq 1)$ is a cube root of unity, then $\frac{1}{\sqrt{3}}\lvert 1 + 2\omega + 3\omega^2 + \ldots + 3n\omega^{3n-1}\rvert (n \in N)$ cannot exceed	(R)	n
(IV)	$\mathrm{Log}_2\left\lvert 1 + \omega + \omega^2 + \omega^5 - \frac{1}{\omega}\right\rvert$ is (ω is 5^{th} root of unity)	(S)	1
		(T)	$\lvert a_1\rvert + \lvert a_2\rvert + \ldots \lvert a_n\rvert$

Which is correct option?

(A) I→ P (B) II→R

(C) III→S (D) IV →Q

44. Observe the following list:

List–I		List-II	
(I)	Let $f(x)=\max\{1+\sin x, 1, -\cos x\}, x\in[0,2\pi]$ and $g(x)=\max\{1,\lvert x-1\rvert\}, x\in R$, then	(P)	$g(f(1))=1$
(II)	Let $f(x)=\ln\left(\frac{1+x}{1-x}\right)\forall x\in(-1,1)$ and $g(x)=\left(\frac{3x+x^3}{1+3x^2}\right)$, then	(Q)	$f(g(0))=0$
(III)	Let $f(x)=1+x^2$ and $g(x)=x-x^2$, then	(R)	$f(g(0))=1$
(IV)	$P(x)=\frac{x}{\sqrt{1+x^2}}, f(x)=p(p(p(x)))$ $g(x)=x+1$	(S)	$g(f(0))=1$
		(T)	$g\left(f\left(\frac{e-1}{e+1}\right)\right)=1$

Which is correct option?

(A) I→ Q (B) II→T

(C) III→Q (D) IV →Q

45. Observe the following list:

List–I		List-II	
(I)	$\int(\tan x)^{1/3}dx=A\ln\frac{(t^4-t^2+1)}{(t^2+1)^2}+B\tan^{-1}\left(\frac{2t^2-1}{\sqrt{3}}\right)+c,$ where $t=\tan^{1/3}x$	(P)	$A=\frac{1}{4}$
(II)	$\int\left(\frac{\sin x+\sin^3 x}{\cos 2x}\right)dx=A\cos x+B\ln\left\lvert\frac{\sqrt{2}\cos x+1}{\sqrt{2}\cos x-1}\right\rvert+c$	(Q)	$A=\frac{1}{3}$
(III)	$\int\frac{dx}{(x^2+1)(x^2+4)}=A\tan^{-1}x+B\tan^{-1}\left(\frac{x}{2}\right)+c$	(R)	$A=\frac{1}{2}$
(IV)	$\int\frac{1+\cos 8x}{\cot 2x-\tan 2x}dx=\frac{-\cos 8x}{48A}+C$	(S)	$B=\frac{\sqrt{3}}{2}$
		(T)	$B=\frac{3}{4\sqrt{2}}$

Which is correct option?

(A) I→S (B) II→S

(C) III→P (D) IV →T

46. Match the entries from the following two list:

List–I		List-II	
(I)	If $\mu < \int_0^2 \left(\frac{5-x}{9-x^2}\right)dx < \lambda$, then	(P)	$[\lambda+2]=9$, where [.] denotes the greatest integer function.
(II)	If $\mu < \int_{\pi/4}^{\pi/3} \frac{\sin x}{x}dx < \lambda$, then	(Q)	$[\lambda-2]=8$ where [.] denotes the greatest integer function.
(III)	If $\mu < \int_1^3 \sqrt{(3+x^3)}\,dx < \lambda$, then	(R)	$[\lambda+\mu]=0$, where [.] denotes the greatest integer function
(IV)	$\mu < \int_{\frac{1}{10}}^{2} x^x\,dx < \lambda$	(S)	$[\lambda-\mu]=6$, where [.] denotes the greatest integer function
		(T)	$[5\lambda-\mu]=5$, where [.] denotes the greatest integer function

Which is correct option?

(A) I→ T (B) II→P

(C) III→P (D) IV →Q

Section – B (Maximum Marks: 24)

*This section contains **EIGHT (08)** numerical based questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.*

47. If $P(n)=\prod_{r=3}^{n}\frac{(r^3+3r)^2}{r^6-64}$, then value of $\lim_{n\to\infty} P(n)$ is, $(n\in N)$?

48. The value of $600\sum_{a=1}^{\infty}\sum_{b=1}^{\infty}\sum_{c=1}^{\infty}\frac{ab(2a+c)}{4^{a+b+c}(a+b)(b+c)(c+a)}$ is?

49. $f:R\to R,\ f(x)=\frac{3x^2+mx+n}{x^2+1}$. If the range of this function is $[-4, 3)$, then find the value of m^2+n^2.

50. Find the value $2\cos^3\frac{\pi}{7}-\cos^3\frac{\pi}{7}-\cos\frac{\pi}{7}+1$

51. If the minimum value of $x^2+2xy+3y^2-6x-2y\ (x,y\in R)$, *is* T *then* $\frac{T+12}{4}$ *is*

52. Area bounded by 2 branches of curve $(y-x)^2=x^3$ and line $x=1$

53. A continuous function $f(x)$ satisfy differential equation $f(x)=\left(1+x^2\right)\left\{1+\int_0^x \frac{f^2(t)}{1+t}dt\right\}$ then the value of $f(-2)$ is?

54. If the function $f(x)=axe^{-bx}$ has a local maximum at the point (2, 10) then "be/a" is