FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2024
FULL TEST – V
PAPER –1
TEST DATE: 08-02-2024

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 –03, 18 – 20, 35 – 37):* 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 *(04 – 07, 21 – 24, 38 – 41)*: This section contains **TWELVE (12)** questions. Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.

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

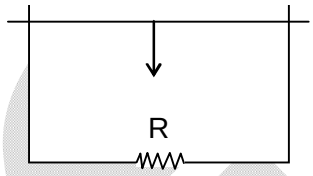
Physics

PART – I

SECTION – A
(One 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).*

1. A straight conductor with its length in the East-West direction falls under gravity. As a result of this motion being in the Earth's magnetic field, choose the correct option(s).



(A) induced emf develops with the East end of the conductor at higher potential than the West end.
(B) induced emf develops with the East end of the conductor at lower potential than the West end.
(C) induced current passes from East end to the West end in resistor.
(D) induced current passes from West end to the East end in rod.

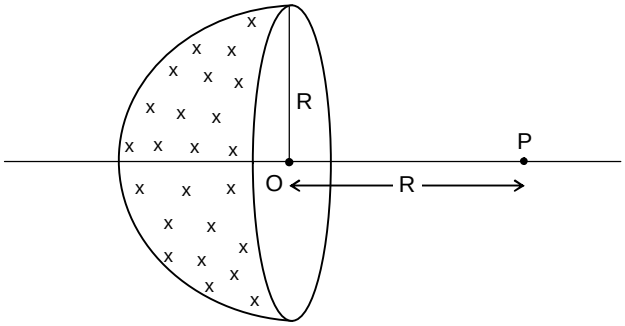
2. The magnetic flux ϕ linked with a conducting coil depends on time as $\phi = 4t^n + 6$, where n is positive constant. The induced emf in the coil is e:
(A) If $0 < n < 1$; $e \neq 0$ and $|e|$ decreases with time.
(B) If $n = 1$; e is constant.
(C) If $n > 1$; $|e|$ increases with time.
(D) If $n > 1$; $|e|$ decreases with time.

3. 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.

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.*

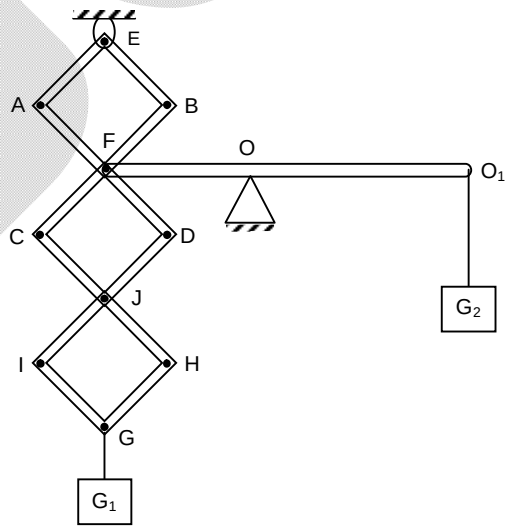
4. Find ratio of electric field to electric potential at point P due to a uniformly charged hollow hemisphere at a distance R form center O of the hemisphere.



(A) $\frac{1}{R}$ (B) $\frac{1}{2R}$

(C) Not defined (D) $\frac{2}{R}$

5. Bars AD, BC, CH, DI & arm OO_1 of the lever are twice as long as bars AE, EB, IJ, JH, IG, GH and arm FO respectively. Disregard the weight of the bars & the horizontal rod. The system is pinned at points A, B, F,, C, D, J, I, H and E. What is the ratio between the weights G_1 & G_2 if the system shown in figure is in equilibrium?



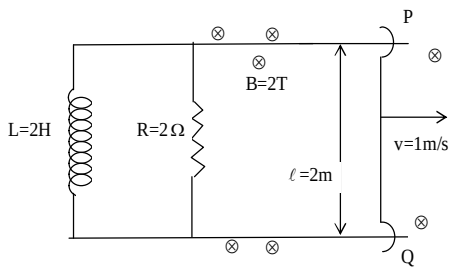
(A) $\frac{G_1}{G_2}=\frac{2}{3}$

(B) $\frac{G_1}{G_2}=\frac{3}{2}$

(C) $\frac{G_1}{G_2}=\frac{1}{2}$

(D) $\frac{G_1}{G_2}=2$

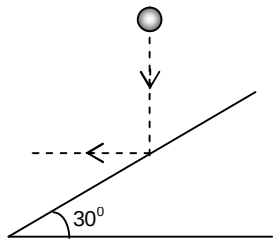
6. The given figure shows an inductor and resistance fixed on a conducting wire. A movable conducting wire PQ starts moving on the fixed rails from t = 0 with constant velocity 1m/s. The work done by the external force on the wire PQ in 2 seconds is



(A) 16J (B) 32J

(C) 48J (D) 64J

7. A ball is released form a point, it goes vertically downwards and collides with a fixed smooth inclined plane of angle of inclination of 30^0. After the collision the ball goes horizontally. The coefficient of restitution between the ball and the inclined plane is



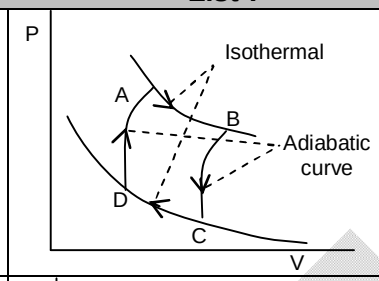
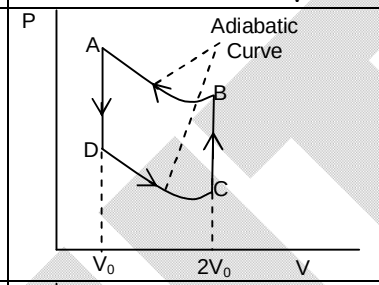
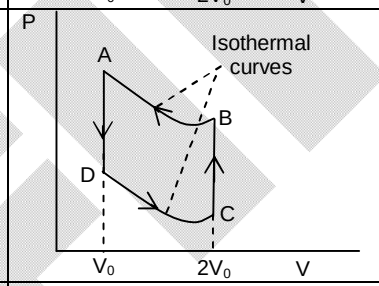
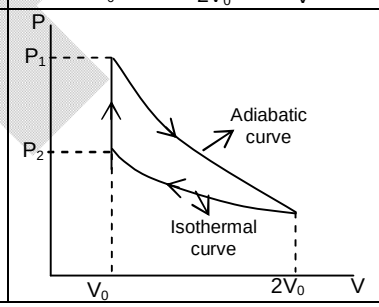
(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) 1 (D) None of these

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.*

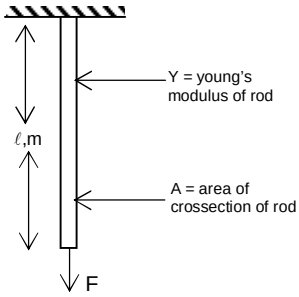
8. Match the following:

List-I		List-II	
(P)		(1)	$Q_{cycle} > 0$
(Q)		(2)	$Q_{cyc} < 0$
(R)		(3)	$W_{cycle} > 0$
(S)		(4)	$W_{cyc} < 0$

The correct option is:

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

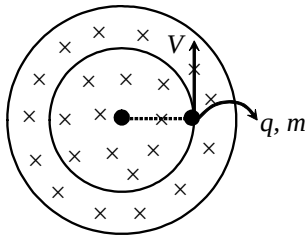
9. Match the following:



List-I		List-II	
(P)	Stress at a distance x from lower end	(1)	$\frac{1}{2}\frac{YA}{\ell}(\Delta\ell)^2$
(Q)	Speed of longitudinal wave in rod	(2)	$\sqrt{\frac{\ell F+mgx}{m}}$
(R)	Speed of transverse wave in rod at a distance x from lower end	(3)	$\frac{F+\frac{mgx}{\ell}}{A}$
(S)	If elongation of rod is Δl then elastic pot. energy in the rod will be	(4)	$\sqrt{\frac{YA\ell}{m}}$

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

10. The central cross-section of a long cylindrical region containing uniform but time varying magnetic field *B* is shown. A particle of constant mass and variable positive charge moves in a circle in the plane, so that the radius of the circle remains constant.



List-I		List-II	
(P)	If the magnetic field is increased by 2%, the speed of the particle will	(1)	decrease
(Q)	If the magnetic field is decreased by 4%, the speed of the particle will	(2)	increase
(R)	If the magnetic field is increased by 2%, the charge of the particle will	(3)	change by 1%
(S)	If the magnetic field is decreased by 4%, the charge of the particle will	(4)	change by 2%

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

11. Match the statements in List-I with the result in List-II.

List-I		List-II	
(P)	A thin uniform spherical shell of surface area S has an initial temperature more than its surrounding atmosphere. Then magnitude of rate of change of its temperature with time	(1)	Is independent of S
(Q)	A soap bubble initially in equilibrium is given a charge Q, which distributes uniformly over its surface. The centre of the bubble is always fixed. For the duration the bubble having surface area S expands the magnitude of electric potential at a fixed point always lying outside the bubble	(2)	Depends on S
(R)	A container with open top and filed with ideal liquid is placed at rest on a smooth horizontal table. A small hole of area S is drilled at the bottom of a side wall of container. The magnitude of force exerted by escaping liquid on the container	(3)	Remains constant
(S)	An infinitely long straight current carrying wire lies along the axis of a closed cylindrical surface of total surface area S is space. As the magnitude of current in the wire is continuously increased, the magnitude of the magnetic flux through the surface of this cylinder	(4)	Decrease with time

The correct option is:

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

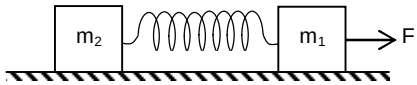
(C) P – 1,3 ; Q – 3,4 ; R – 1,2 ; S – 2,3 (D) P – 2,4 ; Q – 1,3 ; R – 2,4 ; S – 1,3

SECTION – B

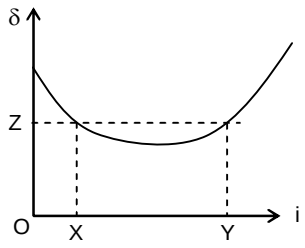
(Numerical Answer Type)

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

12. Two blocks of masses m_1 = 1 kg and m_2 = 2 kg are connected by a non deformed light spring. They are lying on a rough horizontal surface. The coefficient of friction between the blocks and the surface is 0.4, what minimum constant force F (In N) has to be applied in horizontal direction to the block of mass m_1 in order to shift the other block? (g = 10 m/s^2)



13. Graph shown is between deviation (δ) and angle of incidence I then angle of prism is (in degree) [x = 30°, y = 32° & z = 60°]

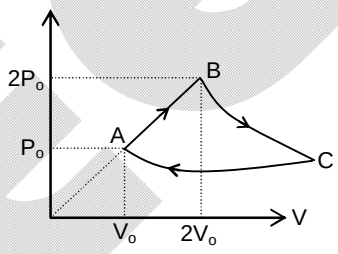


14. A steel wire 4.0 m in length is stretched through 2.0 mm. The cross-sectional area of the wire is 2.0 mm^2. If Young's modulus of steel is 2.0×10^{11} N/m^2. If the energy density of the wire is $\frac{x\,10^4}{2} J/m^3$ then find the value of 'x'.

15. A bus is moving towards a huge wall with a velocity of 5 m/s. the driver sounds a horn of frequency 200 Hz. What is the frequency of beats heard by a passenger of the bus, if the speed of sound in air is 330 m/s.

16. A particle of mass 0.50 kg executes a simple harmonic motion under a force $F = -(50\ \ N/m)x$. If it crosses the mean position with a speed of 10 m/s, find the amplitude (in m) of the motion.

17. One mole of a diatomic gas is taken around a cyclic process shown in the figure. The process BC is adiabatic expansion and the process CA is isothermal compression. If the volume of the gas at C is given by $V_c = (2)^n V_0$, then the value of 'n' is



Chemistry

PART – II

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

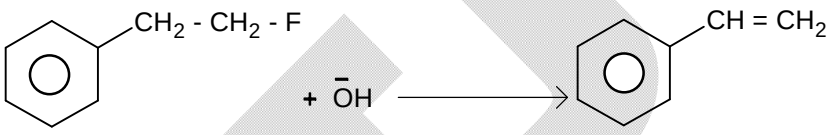
*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

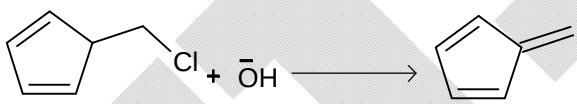
18. Which is correctly matched?

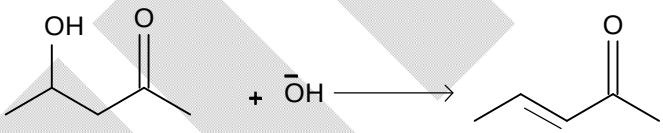
List–I		List–II	
(P)	$\Delta S_{total} = 0$	(1)	Adiabatic reversible expansion
(Q)	$\Delta S_{sys} = 0$	(2)	Isothermal reversible expansion
(R)	$\Delta S_{surr} = 0$	(3)	Free expansion
(S)	$\Delta S_{total} > 0$	(4)	Adiabatic irreversible expansion
		(5)	Isothermal irreversible expansion

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

19. Which is/are example(s) involve E^1_{CB} as major mechanism?

(A) 

(B) 

(C) 

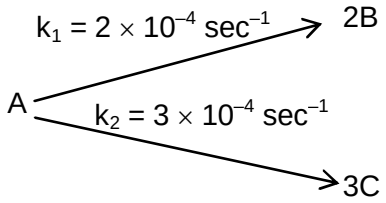
(D) $CH_3CH_2Cl + {}^-OH \xrightarrow{\Delta} CH_2 = CH_2$

20. BrF_3 is most common non-aqueous ionizing solvents among inter halogen compounds due to
(A) it has convenient liquid range(b.p = 126^{o}C)
(B) it is a good, but not too violent fluorinating agent
(C) it self ionizes considerably and much more than ClF_3
(D) it is most reactive inter-halogen compound

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.*

21. For the following parallel reaction



If the sum of the concentration of B and C at any time is 2 M then what will be $[B]_t$ and $[C]_t$ respectively?

(A) $\frac{11}{12}$M, $\frac{13}{12}$M (B) $\frac{3}{4}$M, $\frac{5}{4}$M

(C) $\frac{4}{5}$M, $\frac{6}{5}$M (D) $\frac{8}{13}$M, $\frac{18}{13}$M

22. Mutaroration is most favourable in

(A) non-polar solvent (B) acidic solvent

(C) basic solvent (D) amphiprotic solvent

23. For a weak acid HA, the degree of dissociation α is equal to

(A) $\frac{1}{10^{P_{K_a}-pH}}$ (B) $\frac{1}{1+10^{P_{K_a}-pH}}$

(C) $\frac{1}{10^{pH-P_{K_a}}}$ (D) $\frac{1}{1+10^{pH-P_{K_a}}}$

24. Liquid O_2 is blue in colour due to electronic transition from

(A) triplet ground state to singlet excited state

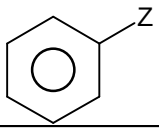
(B) single ground state to triplet excited state

(C) charge transfer

(D) polarisability

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.*

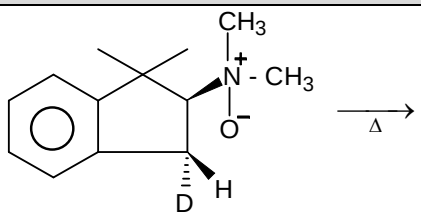
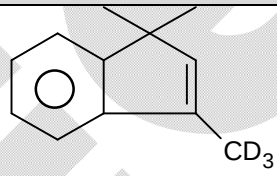
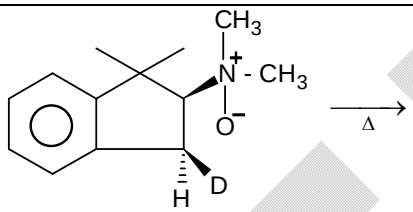
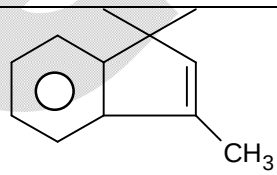
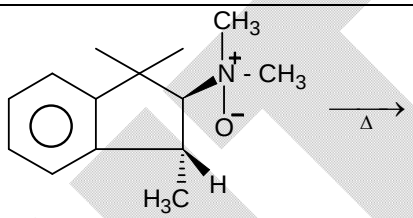
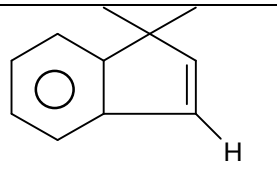
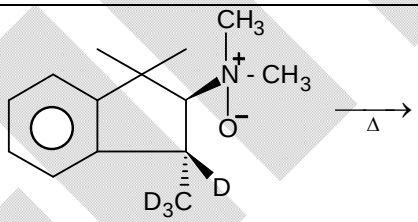
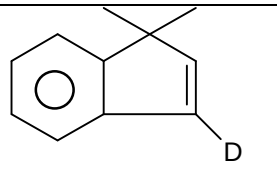
25. For each of the statements in list – I, choose a substituent from list– II that fits the description for the compound. 

List – I		List – II	
(P)	Z-donates electrons inductively, but does not donate or withdraw electrons by resonance	(1)	–OH

(Q)	Z-withdraws electrons inductively, and withdraws electrons by resonance	(2)	–Br
(R)	Z-deactivates the ring towards electrophile and directs ortho, para positions	(3)	–H
(S)	Z-withdraws electrons inductively but donates electrons by resonance and activates the ring	(4)	-Et
		(5)	$-NO_2$

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

26. Match the following:

List – I		List – II	
(P)		(1)	
(Q)		(2)	
(R)		(3)	
(S)		(4)	
		(5)	NH_3

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

27. Match the following:

List – I		List– II	
(P)	α- or rhombic sulphur	(1)	Thermodynamically most stable above 95.5^{o}C
(Q)	β-monoclinic sulphur	(2)	Highly soluble in water
(R)	Υ-monoclinic sulphur	(3)	Thermodynamically most stable at SATP

(S)	Engle's sulpur(e-sulphur)	(4)	Made by chilling hot concentrated solution of sulphur in solvents CS_2 or EtOH
		(5)	Made by pouring $Na_2S_2O_3$ solution into concentrated HCl and extracting the sulphur in toluene solvent

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

28. Match the following:

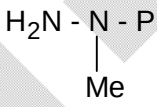
List – I		List– II	
(P)	BaC_2	(1)	Constituent of holme's signal
(Q)	Ca_3P_2	(2)	Ethynide
(R)	Al_4C_3	(3)	Propynide
(S)	Mg_2C_3	(4)	Methanide
		(5)	Carbon is present in zero oxidation number

(A) P → 2, Q → 1, R → 4, S → 3 (B) P → 1, Q → 2, R → 3, S → 4
(C) P → 3, Q → 2, R → 1, S → 4 (D) P → 2, Q → 1, R → 4, 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. 1 mole of glucose reacts with x mole of  , maximum value of x is

30. If the solubility of solid zinc hydroxide at pH = 5 is x. What is the value of x/2?
Given:

$Zn(OH)_2(s) \rightleftharpoons Zn(OH)_2(aq);\ K_1 = 10^{-6}\ M$

$Zn(OH)_2(aq) \rightleftharpoons [Zn(OH)]^+ + OH^-;\ K_2 = 10^{-7}\ M$

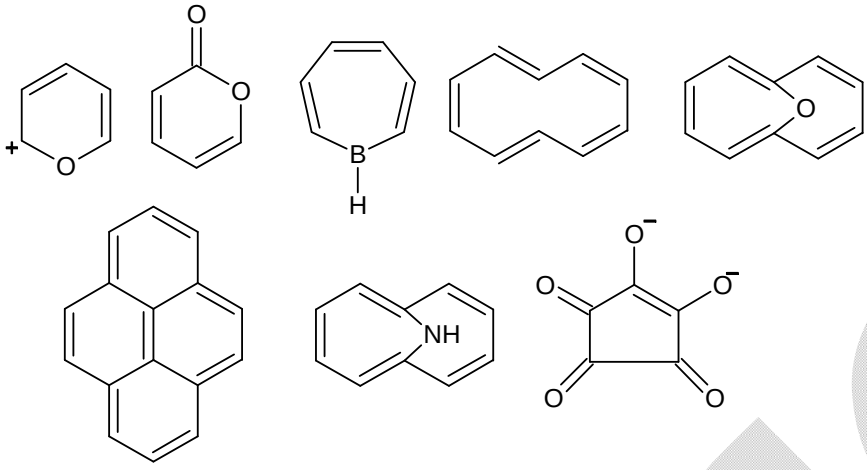
$[Zn(OH)]^+ \rightleftharpoons Zn^{2+} + OH^-;\ K_3 = 10^{-4}\ M$

$[Zn(OH)_2](aq) + OH^- \rightleftharpoons [Zn(OH)_3]^-;\ K_4 = 10^3\ M^{-1}$

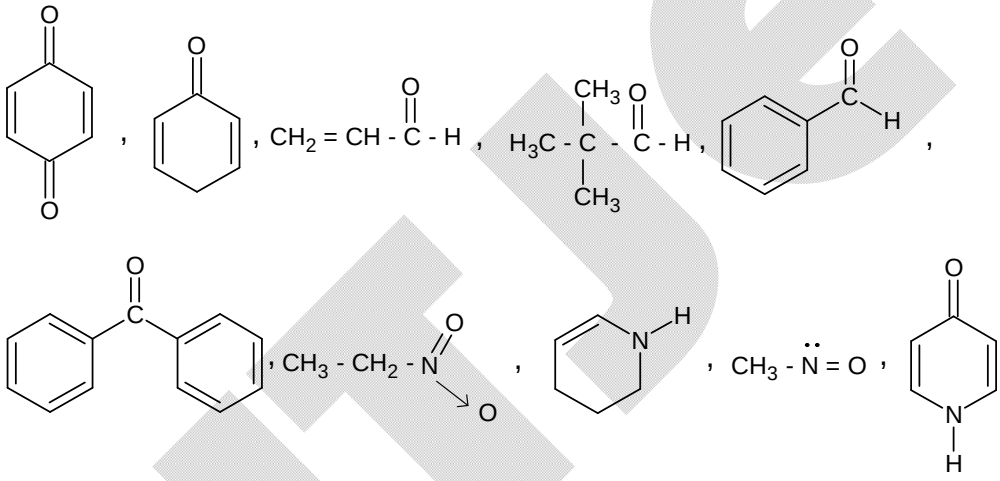
$[Zn(OH)_3]^- + OH^- \rightleftharpoons [Zn(OH)_4]^{2-};\ K_5 = 10\ M^{-1}$

31. Number of heteroatom in a molecule of
Tear gas is x
Mustard gas is y
Phosgene is z
Value of x + y – z is

32. Number of aromatic species is



33. How many of the given molecule can show tautomerism?



34. What is the minimum number of H_2O molecules required to convert P_4O_{10} into non-cyclic structure?

Mathematics

PART – III

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).*

35. Let f be twice differentiable real valued function satisfying $f'(x) \neq 0$ $f(x) + f''(x) = -x\,g(x)f'(x)$ where $g(x) > 0\ \forall x > 0$. If $f(0) = -3$ and $f'(0) = 4$ then

(A) $|f(x)| \leq 5 \forall x > 0$ (B) $[f(x)]^2 + [f'(x)]^2$ is decreasing $\forall x > 0$

(C) $|f(x)| > 5 \forall x > 0$ (D) $[f(x)]^2 + [f'(x)]^2$ is increasing $\forall x > 0$

36. P is point on $y^2 = 12x$ such that it's focal distance is 6. Tangent at P intersects tangent at vertex at point T (y > 0) Point R is on the x axis inside parabola such that $SR = 6$ (S is focus) M is point on the parabola such that tangents at M and P meet at point N such that $SN = 5$ then

(A) Area of quadrilateral PRST is 18 units square
(B) Area of quadrilateral PRST is 27 units square
(C) Sum of squares of possible ordinates of M is 28
(D) Sum of squares of possible ordinates of M is 30

37. A point P inside the square with vertices A (1, 1), B (–1, 1), C (–1, –1) and D (1, –1) such that minimum $\{PA, PB, PC, PD\} \leq 1$. If the area bounded by the curve traced out by moving point P is λ then which of the following is/are correct.

(A) λ is rational number
(B) $[\lambda] = 3$ (where [.] represents greatest integer function)
(C) λ is irrational number
(D) $[\lambda] = 0$ (where [.] represents greatest integer function)

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.*

38. If the graph of quadratic expression $f(x) = ax^2 + bx + c$ has vertex at $(4, 2)$ and $a \in [1, 3]$ then the expression abc has

(A) Maximum value – 144 (B) Minimum value –144
(C) Maximum value 3600 (D) Minimum value 144

39. A line meet the co –ordinate axis in A and B. A circle is circumscribed about the triangle OAB. If m and n are the distances of the tangents to the circle at the origin (O) from point A and B respectively, the diameter of circle is

(A) $m(m+n)$ (B) $m+n$

(C) $n(m+n)$ (D) $\frac{1}{2}(m+n)$

40. Sum of series $S=\sum_{r=0}^{n}\frac{3^{r+4}\cdot {}^{n}C_{r}}{{}^{r+4}C_{4}}+\frac{\sum_{r=0}^{3}{}^{n+4}c_{r}\,3^{r}}{{}^{n+4}C_{4}}$ is

(A) $\frac{4^{n+4}}{{}^{n+3}C_{3}+{}^{n+3}C_{n-1}}$ (B) $4^{n+4}\left({}^{2n}C_{4}\right)$

(C) $\frac{4^{n}}{{}^{n+4}C_{4}}$ (D) $\frac{3^{n+4}+2^{n+4}}{{}^{n+4}C_{4}}$

41. $\sum_{k=1}^{88}(-1)^{k+1}\frac{1}{\sin^{2}(k+1)^{o}-\sin^{2}1^{o}}$ is equal to

(A) $\tan 2^{o}$ (B) $\cot 2^{o}$

(C) $\frac{\sin 2^{o}}{\cot 2^{o}}$ (D) $\frac{\cot 2^{o}}{\sin 2^{o}}$

SECTION – A
(Matching List Type)

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

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

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

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

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

43. A box contains 30 tickets each with number from 1 to 30. Four tickets are drawn at random and without replacement. Let p, q, r, s be the number on the ticket drawn.

List - I		List - II	
(P)	Probability that min (p, q, r, s) < 15 is	(1)	$\frac{19}{609}$
(Q)	The probability that second smallest number is 20	(2)	$\frac{298}{261}$

(R)	The probability that $p+q+r+s$ is even	(3)	$\frac{103}{609}$
(S)	The probability that pqrs is even	(4)	$\frac{731}{783}$
		(5)	$\frac{2591}{5481}$

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

44.

List - I		List - II	
(P)	The number of integral solutions of $4\int_0^{\infty} \frac{\ell n t}{x^2+t^2} dt = \pi \ln 2, t > 0$	(1)	12
(Q)	If $\int_1^e \frac{x^4 \ln x + 2}{x^3 \ln x + x} dx = \frac{e^2+a}{b} - \ln\left(e^2+1\right)$ then $a+b$ is	(2)	0
(R)	The number of solution of equation $2\tan^{-1}\left(\sec^2 \pi x\right) = \sin^{-1}\left(x^3 - x^2 + x + 2\right)$ is	(3)	5
(S)	$f: R \to R, f(x) = x^4 + x^2 + 1$ then the number of values of x for which $f\left(f\left(f(x)\right)\right) \le x^8$ is K then $K+10$ is	(4)	2
		(5)	15

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

45. Consider a sequence $\{b_n\}$ of integers such that b_1, b_2, b_3 are in G.P. b_2, b_3, b_4 are in A.P., b_3, b_4, b_5 are in G.P., b_4, b_5, b_6 are in A.P., b_5, b_6, b_7 are in G.P. and so on. Also given that $b_1 = 1$ and $b_5 + b_6 = 198$. Then

List-I		List-II	
(P)	$\sqrt{b_7}$ is equal to	(1)	5
(Q)	Sum of digits of b_8 is equal to	(2)	15
(R)	$\sqrt{b_9}$ is equal to	(3)	9
(S)	Sum of digits of b_{10} is equal to	(4)	17
		(5)	13

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

SECTION – B

(Numerical Answer Type)

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

46. The number of ways to sit 4 couples around the round table such that no two persons from the same couple sit next to each other is

47. Consider the system of equations $ax + y = b,\ bx + y = a,\ ax + by = ab$, where $a, b \in \{0,1,2,3,4\}$ then the number of ordered pairs (a, b) for which system is consistent is equal to

48. Find the number of common solution(s) of equation $\cos 2x + \left(1-\sqrt{3}\right) = \left(2-\sqrt{3}\right)\cos x$ and $\sin 3x = 2\sin x$ which satisfy the inequality $\sqrt{3}\tan x - 1 \geq 0$ in $[0, 5\pi]$

49. The sequence is defined as follows $a_1 = \frac{1}{2},\ a_{n+1} = a_n^2 + a_n$

$S = \frac{1}{a_1+1} + \frac{1}{a_2+1} + \frac{1}{a_3+1} + ... + \frac{1}{a_{100}+1}$ then $[S]$ is
(where [.] represent Greatest Integer Function)

50. Let $2x^2 + y^2 - 3xy = 0$ be the equation of a pair of tangents drawn from the origin O to a circle of radius 3 with centre in the first quadrant. If A is one of the points of contact. If $OA = \lambda + \sqrt{\mu}$, then the value of $\left[\frac{\lambda^2+\mu}{100}\right]$ must be _____
(where [.] greatest integer function)

51. Urn A contains four white balls and two red balls. Urn B contains three red balls and three black balls. An urn is randomly selected and then a ball inside of that urn is drawn. The process of selecting an urn and drawing out a ball is repeated, without replacing the first ball. Let 'p' be the probability that the first ball drawn was red, given that the second ball drawn was black, than 15 p equals