FIITJEE

ALL INDIA TEST SERIES

FULL TEST – V

JEE (Advanced)-2019

PAPER – 2

TEST DATE: 27-01-2019

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-D.**

1. ***Section-A (01 – 06, 19 – 24, 37 – 42)*** *contains 18 multiple choice questions which have* ***one or more than one correct*** *answer. Each question carries* ***+4 marks*** *for all correct answer.*
   *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, both of which are correct options.*
   *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 (07 – 10, 25 – 28, 43 – 46) *contains 12 questions. Each question has* ***TWO (02)*** *matching lists:* ***LIST-I*** *and* ***LIST-II****.* ***FOUR*** *options are given representing matching of elements from* ***LIST-I*** *and* ***LIST-II****.* ***ONLY ONE*** *of these four options corresponds to a correct matching.*
   For each question, choose the option corresponding to the correct matching.
   Each question has ***only one correct*** *answer and carries* ***+3 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

2. ***Section-D (11 – 18, 29 – 36, 47 – 54)*** *contains 24 Numerical answer type questions with answer XXXXX.XX and each question carries* ***+3 marks*** *for correct answer. There is no negative marking.*

Physics

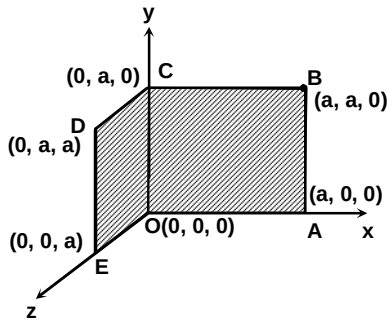
PART – I

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

This section contains **6** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

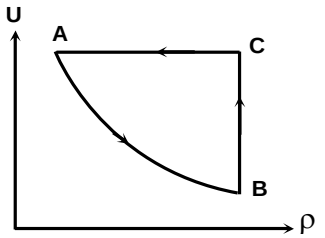
1. The length of sonometer wire between two fixed ends is 100 cm. Three bridges be placed so as to divide the wire into four segments whose fundamental frequencies are in the ratio of 1 : 2 : 3 : 4 from the left end. Then which of the following is/are correct.
   (A) The position of the first bridge from the left fixed end is 48 cm
   (B) The position of the 2nd bridge from the right fixed end is 28 cm
   (C) The position of the 3rd bridge from the left fixed end is 88 cm
   (D) The separation between the first bridge and the 3rd bridge is 40 cm

2. Two surface OABC and OCDE lies in the plane of xy and yz as shown in the figure. A charged particle 'q' lies in the space at a point P, if

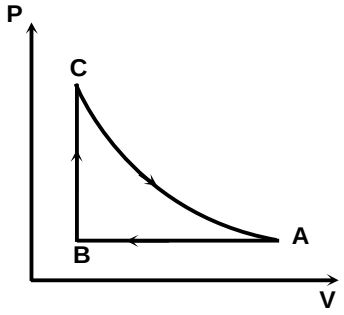


   (A) coordinates of 'P' is (a – Δr, a – Δr, Δr) and a >> Δr, then flux passing through surface OABC is $\frac{7q}{24\varepsilon_0}$.
   (B) coordinates of 'P' is (a – Δr, a – Δr, Δr) and a >> Δr, then flux passing through surface OCDE is $\frac{q}{24\varepsilon_0}$.
   (C) coordinates of 'P' is (a + Δr, a + Δr, –Δr) and a >> Δr, then flux passing through surface OABC is $\frac{q}{24\varepsilon_0}$.
   (D) coordinates of 'P' is (a + Δr, a + Δr, –Δr) and a >> Δr, then flux passing through surface OCDE is $\frac{q}{24\varepsilon_0}$.

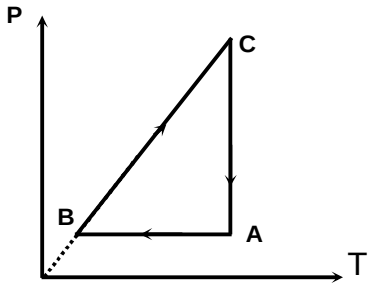
3. U-ρ (U $\rightarrow$ internal energy of the gas and ρ $\rightarrow$ density of the gas) plot of an ideal mono-atomic gas undergoing a cyclic process is shown in the figure. A $\rightarrow$ B is part of a rectangular hyperbola. Then which of the following graphs in options below crosspond to the process given in adjacent diagram?



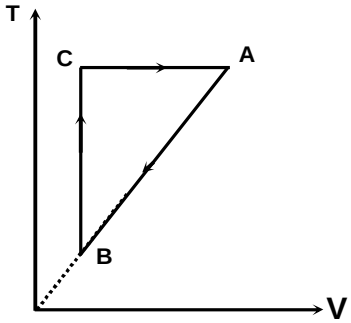
(A)



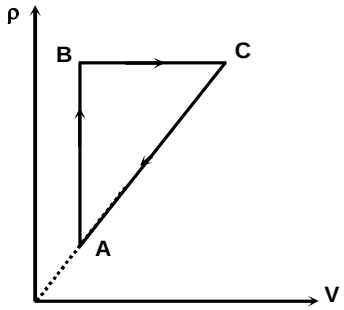
(B)



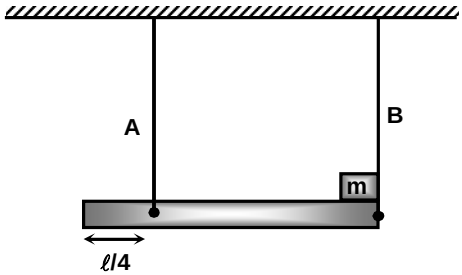
(C)



(D)



4. A uniform rod of mass 'm' and length 'ℓ' is held horizontally by two vertical strings 'A' and 'B' of negligible mass and a small block of mass 'm' is also placed on the top of the rod as shown in the figure. Then which of the following is/are correct.



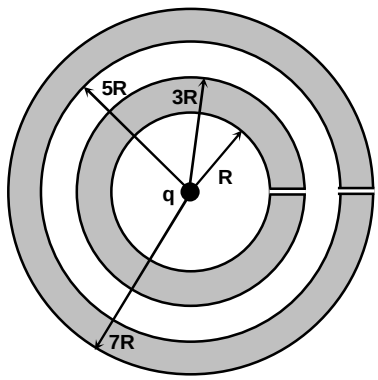
(A) The tension in the string 'A' immediately after the string 'B' is cut, is $\frac{4}{7}mg$.

(B) The tension in the string 'A' immediately after the string 'B' is cut, is $\frac{2}{7}mg$.

(C) The acceleration of centre of mass of the rod immediately after the string 'B' is cut, is $\frac{3}{7}g$.

(D) The acceleration of centre of mass of the rod and the block immediately after the string 'B' is cut, is $\frac{5}{7}g$.

5. A small charged particle 'q' lies at the centre of two concentric conducting hollow spheres of inner radii R and 5R and outer radii 3R and 7R respectively. Then which of the following is/are correct.



(A) The energy stored in the space between 3R to 5R (cavity) is $\frac{kq^2}{15R}$.

(B) The energy stored in the space between 3R to 5R (cavity) is $\frac{kq^2}{30R}$.

(C) The amount of work has to be performed to slowly transfer the charge 'q' from center through the orifice to infinity is $\frac{29}{210}\frac{kq^2}{R}$.

(D) The amount of work has to be performed to slowly transfer the charge 'q' from center through the orifice to infinity is $\frac{38}{105}\frac{kq^2}{R}$.

6. A source 'S' of sound wave of fixed frequency 'f' and an observer 'O' are located in air initially at the space point A and B, a fixed distance apart. State in which of the following cases, the observer will not see any Doppler effect and will receive the same frequency 'f' as produced by the source

(A) Both the source 'S' and observer 'O' remains stationary but wind blows with constant speed in arbitrary direction.

(B) The observer 'O' remains stationary but the source 'S' moves parallel to and in the same direction and with the same speed as wind.

(C) The source 'S' remains stationary but the observer 'O' and the wind have same speed away from the source.

(D) The source 'S' and the observer 'O' move directly against the wind but both with the same speed.

(Matching List Type)

This section contains **FOUR** questions. Each question has **TWO** matching lists: **LIST - I** and **LIST - II**. **FOUR** options are given representing matching of elements from **LIST - I** and **LIST - II**. **ONLY ONE** of these four options corresponds to a correct matching.

7. A tank of mass 20m (including shells) fires shells of mass 2m, 4m and 8m with velocity v_0 relative to the tank after firing, in the horizontal direction. The tank is placed over a smooth horizontal surface. Randomly any shell is fired from the tank and all the shells are fired. Then match the following.

	LIST–I		LIST–II
P.	The magnitude of velocity of tank with respect to ground after firing all shell, may be equal to	1.	$\frac{29}{30}v_0$
Q.	The magnitude of velocity of tank with respect to ground after firing all shell, may be equal to	2.	$\frac{4}{5}v_0$
R.	The magnitude of velocity of shell of mass 4m with respect to ground may be equal to	3.	$\frac{59}{60}v_0$
S.	The magnitude of velocity of shell of mass 2m with respect to ground may be equal to	4.	v_0
		5.	$\frac{9v_0}{10}$

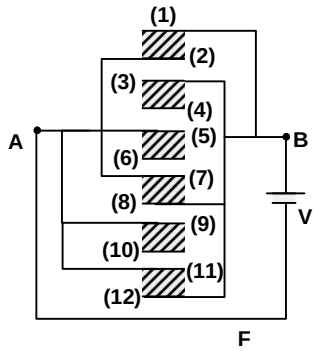
(A) P → 4; Q → 3; R → 1; S → 2

(B) P → 3; Q → 1; R → 2; S → 5

(C) P → 3; Q → 5; R → 4; S → 2

(D) P → 4; Q → 3; R → 5; S → 1

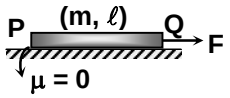
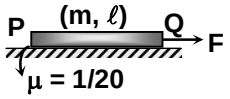
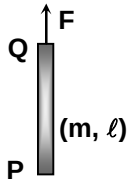
8. All identical capacitor plates each of area A are arranged such that adjacent plates are at d distance apart. Plates are connected to a source of emf V volts as shown in figure. Match the quantities in List –I with their respective answer in List-II. (dielectric constant in each shaded region is k = 2)

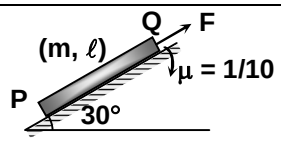


LIST–I		LIST–II	
P.	Charge on plate 3 (multiple of $\frac{\varepsilon_0 AV}{d}$)	1.	4/3
Q.	The heat rejected by the system (multiple of $\frac{13\varepsilon_0 AV^2}{d}$)	2.	1
R.	Equivalent capacitance between AB (multiple of $\frac{13A\varepsilon_0}{d}$)	3.	1/3
S.	Potential difference between the plates 4 and 7 (multiple of V/2)	4.	2/3
		5.	5/3

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

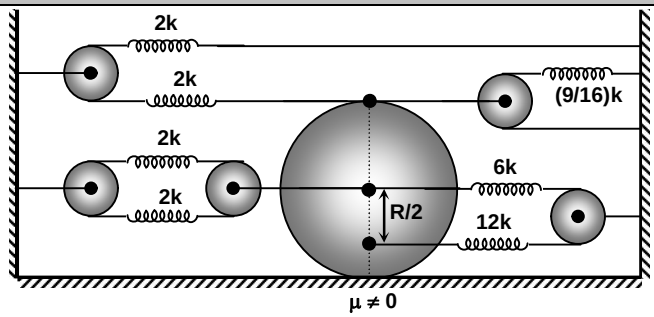
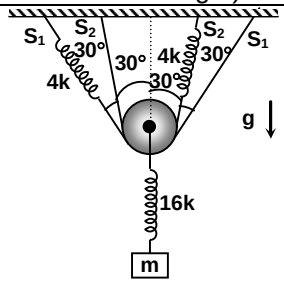
9. In **List –I** a constant force F is applied on the rod of mass m and length 'ℓ' such that in each case rod moves. A transverse pulse is created at the end point P in each case. The time to move the pulse from P to Q is given in **List –II**. Then match the following.

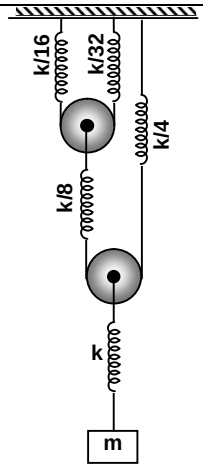
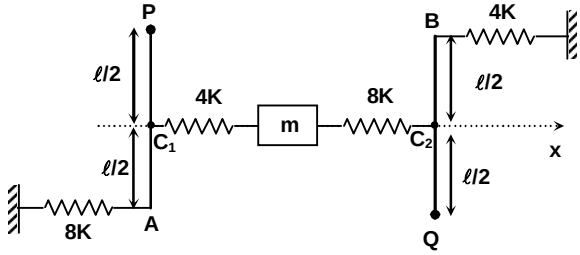
LIST–I		LIST–II	
P.	 (m = 4 kg, ℓ = 20 m, F = 5 N)	1.	12 sec
Q.	 (m = 9 kg, ℓ = 32 m, F = 8 N)	2.	20 sec
R.	 (m = 7 kg, ℓ = 14 m, F = 2 N)	3.	8 sec

S.	 (m = 10 kg, ℓ = 20 m, F = 2 N)	4.	14 sec
		5.	18 sec

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

10. Some rigid body or block connected with springs are shown in List – I. All the rigid body or block shown are in equilibrium and their time periods of oscillation are given in List – II.

List – I		List – II	
(P)	 There is sufficient friction between the disc and horizontal surface such that pure rolling exist. All the springs and pulleys are ideal and massless. If the disc is displaced (rotated anticlockwise) towards left and then released, then the time period of oscillation of the disc is (mass of the disc and its radius is m and R respectively, springs constant of each springs are shown in figure) (In the shown position all the springs are at their natural length)	(1)	$\frac{3\pi}{2}\sqrt{\frac{m}{5k}}$
(Q)	 All the springs and pulleys are ideal and massless. If the block is slightly pulled vertically downward from its equilibrium position, then the time period of oscillation of the block is (assume strings are taught all the time)	(2)	$2\pi\sqrt{\frac{7m}{k}}$

(R)	 All the pulleys and strings are massless and frictionless. Find the time period of oscillation of the block as shown in the figure. (Springs and strings are also massless)	(3)	$\pi\sqrt{\frac{m}{2k}}$
(S)	 In the figure shown arrangement is placed on horizontal frictionless plane. The mass of rod PA and QB are negligible and they are free to rotate about hinge point P and Q respectively in the horizontal plane. The block of mass 'm' is attached to springs. Springs are light and their stiffness are shown in the figure. The block is slightly displaced along x–axis then released. Then the time period of oscillation of the block is	(4)	$\frac{5\pi}{12}\sqrt{\frac{3m}{k}}$
		(5)	$2\pi\sqrt{\frac{m}{2k}}$

(A) P → 3; Q → 4; R → 1; S → 2

(B) P → 4; Q → 3; R → 1; S → 5

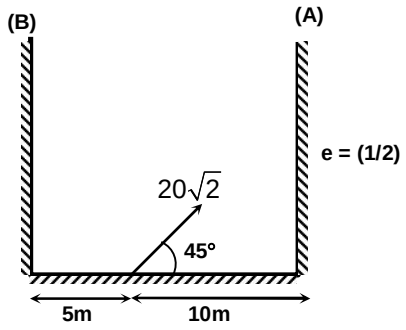
(C) P → 4; Q → 3; R → 2; S → 1

(D) P → 5; Q → 3; R → 4; S → 1

SECTION – D
(Numerical Answer Type)

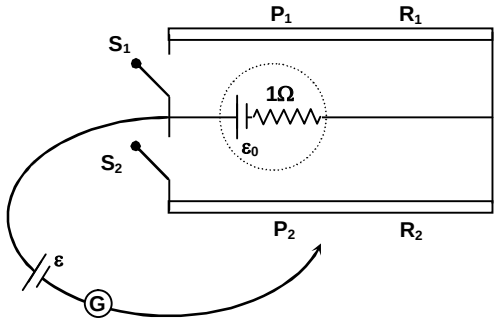
This section contains **EIGHT** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. xxxxx.xx).

11. A ball is projected with speed $20\sqrt{2}$ m/s at an angle of 45° with horizontal it collide with the wall and after two successive collision it comes at the projection point. Then find the coefficient of restitution between ball and wall B.

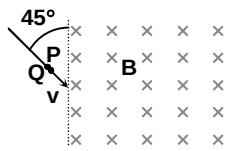


12. A wire is made by attaching two segments together end to end. One segment is made of aluminium and other is steel. The effective linear expansion of two segment is 17×10^{-6}/°C. The fraction length of aluminium is (linear coefficients of thermal expansion of aluminium and steel are 23×10^{-6}/°C and 11×10^{-6}/°C respectively).

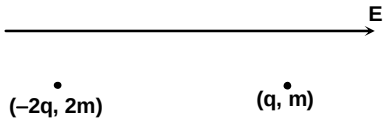
13. Two identical potentiometer P_1 and P_2 of equal length ℓ, resistance R_1, R_2 are connected with a battery of emf ε_0 and internal resistance 1Ω, through two switches S_1 and S_2. A battery of emf ε is balanced on these potentiometer wires one by one. If resistance of wire R_1 is 3.68 Ω and balancing length is $\frac{\ell}{2}$ on it, when S_1 is closed and S_2 is open. On closing S_2 and opening S_1 the balancing length on P_2 is found to be $\frac{2\ell}{3}$, then the resistance of wire R_2 is $k \times 10^{-2}\ \Omega$. Find the value of k.



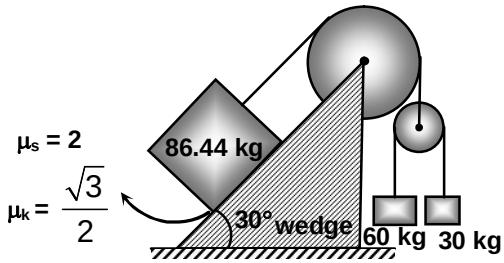
14. Two charged particles P and Q of same mass 'm' having charge q and –q are projected with same magnitude of velocity v into magnetic field B as shown in the figure. Find the maximum separation (in meter) between the charged particles when they are inside the magnetic field. Ignore electric and magnetic effect due to charges on themselves. [take (mv/qB) = 3.14]



15. Two charged particles (m, q) and (2m, –2q) are placed in a gravity free space where a uniform electric field E exists as shown in figure. After the particles are released they stay at a constant distance from each other. What is the distance between them in meter? (Neglected the gravitational interaction). (K is electrostatic constant and take $\frac{kq}{E} = \frac{27}{8}$)

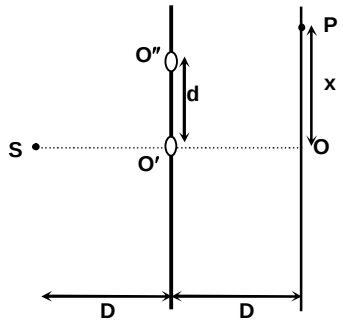


16. All the pulleys and strings are ideal and massless. At t = 0 system is released from rest on the fixed wedge. Find the frictional force acting between the block of mass 86.44 kg and the wedge in Newton. (take g = 10 m/s^2)



17. The main scale of vernier calipers reads in millimeter and its one division is equal to one millimeter. Its vernier is divided into 6 divisions, which coincide with 15 divisions of main scale. Further more when a cylinder is tightly placed along its length between two jaws, it is observed that the zero vernier scale lies just right to 25th division of main scale and fifth division of vernier scale coincide with the main scale. Then find the measured value in millimeter.

18. The minimum value of 'd' so that there is a dark fringe at O is d_{min}. For the value of d_{min}, the distance at which the first bright fringe is formed is 'x' and if the value of 'x' is k × 10^{-3} meter. Then find the value of k. (Given D = 1 m and λ = 1800 Å)

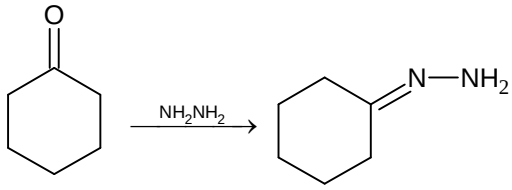


Chemistry

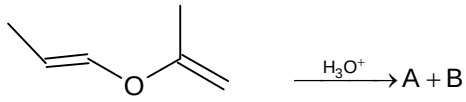
PART – II

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

This section contains **6** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

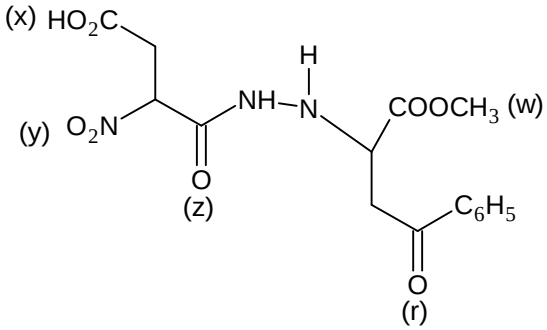
19. 

The correct statements regarding this conversion is
(A) The rate of the reaction is very low at pH = 1
(B) Elimination of water become rds when pH of the reaction mixture is approximately 7
(C) Addition of nucleophile become rds when pH of the reaction is < 4.5
(D) Hydrazine is more nucleophilic than a regular amine in nucleophilic addition reaction of carbonyl compounds

20. 

A and B can be distinguished by
(A) Acidified $K_2Cr_2O_7$ solution
(B) NaOI
(C) Benedict's solution
(D) Brady's reagent

21. Identify the correct statement(s) given for the reduction of the following compounds:



(A) $LiAlH_4$ reduces x, y, z, w, r
(B) $NaBH_4$ reduces 'r' only
(C) Na/C_2H_5OH reduces x, r and w only
(D) $(CH_3)_2CHOH + [(CH_3)_2CHO^-]_3Al, \Delta$ reduces only 'r'

22. In the Froth Floatation process, ZnS and PbS can be separated by
(A) using xanthates
(B) adjusting the proportion of oil to water
(C) using NaCN
(D) using cresols

23. The correct statement (s) about SO_2 is/are
(A) It contains discrete bent molecules in both gaseous and solid state
(B) It can act both as a Lewis acid and as well as Lewis base
(C) It can be prepared by the reaction of dilute H_2SO_4 with metal sulphides
(D) It acts as bleaching agent in moist conditions

24. Which of the following statement(s) is/are correct?
(A) Each sp^3 hybrid orbital has two lobes of unequal size, making the electron density greater on one side of the nucleus than the other
(B) Extent of overlapping in hybrid orbitals is more than that of atomic orbitals
(C) A molecule adopts a particular shape not because of hybridization but to have the lowest possible energy
(D) Hybridization of s and p orbitals to form effective sp^2 hybrids requires that they have comparable radial extent

(Matching List Type)

This section contains **FOUR** questions. Each question has **TWO** matching lists: **LIST - I** and **LIST - II**. **FOUR** options are given representing matching of elements from **LIST - I** and **LIST - II**. **ONLY ONE** of these four options corresponds to a correct matching.

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

LIST–I		**LIST–II**	
P.	Bleaching powder	1.	Molecules have two different oxidation states of same element
Q.	Sodium thiosulphate	2.	Fertilizer
R.	Carbon sub oxide	3.	Oxidizing agent
S.	Ammonium nitrate	4.	Anhydride of malonic anhydride
		5.	Antidote to cyanide poisoning

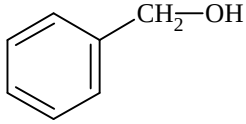
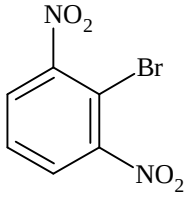
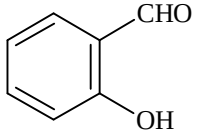
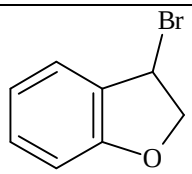
(A) P → 1, 2; Q → 1, 5; R → 1, 4; S → 1, 2
(B) P → 1, 3; Q → 1, 4; R → 1, 5; S → 1, 2, 3
(C) P → 1, 3; Q → 1, 5; R → 1, 4; S → 1, 2, 3
(D) P → 1, 2; Q → 1, 4; R → 1, 5; S → 1, 2

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

LIST–I		**LIST–II**	
P.	DMG	1.	O is donor atom
Q.	Dien	2.	Bidentate ligand
R.	Acetylacetonate	3.	Ambidentate ligand
S.	Glycinate	4.	N is donor atom
		5.	Tridentate ligand

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

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

LIST–I		LIST–II	
P.		1.	Nucleophilic substitution
Q.		2.	Nucleophilic addition
R.		3.	Esterification with $(CH_3CO)_2O$
S.		4.	Dehydrogenation on treatment with Cu at 300^oC
		5.	Dehydrohalogenation

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

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

LIST–I		LIST–II	
P.	PTFE	1.	Used in preparing gaskets
Q.	Neoprene	2.	Biodegradable
R.	PHBV	3.	Thermoplastic
S.	PVC	4.	Produced by free radical polymerization
		5.	Vulcanisation improve physical properties
		6.	Polyster

(A) P → 3, 4; Q → 1, 5; R → 2, 5, 6; S → 3, 4
(B) P → 1, 3, 4; Q → 1, 4, 5; R → 2, 3, 6; S → 3, 4
(C) P → 3, 4, 5; Q → 1, 4; R → 2, 6; S → 1, 3, 5
(D) P → 1, 3; Q → 1, 4, 5; R → 2, 5, 6; S → 1, 3, 4

SECTION – D
(Numerical Answer Type)

This section contains **EIGHT** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. xxxxx.xx).

29. Chandreyi went to beauty parlour to bleach her hair by H_2O_2 solution. Requirement of oxygen for a good bleach is 10% by mass of hair. Knowing mass of her hair to be 520 g, what concentration of H_2O_2 (in M); she should be looking at the beauty parlour (if each bottle contains 500 ml of H_2O_2 and fully consumed during the bleach)?

30. Wave length of first line of Balmer series of He^+ ion is x times of that of its last line. Then the value of x would be:

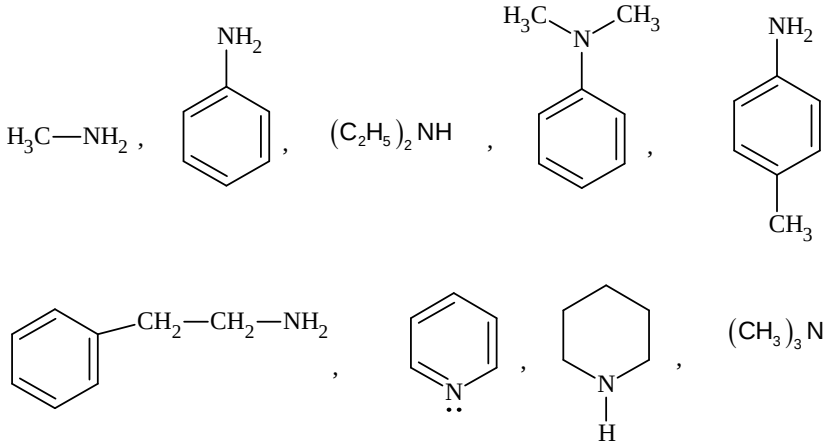
31. Among the following if number of linear molecules are x and number of angular molecules are y. then value of x/y would be?

O_3, N_2O, NO_2, SO_2, CO_2, $SnCl_2$, Cl_2O, HCN, $\overset{+}{N}O_2$

32. If number of electrons present in 1990 mg of perchlorate ion is a $\times 10^{23}$. Then the value of a would be? ($N_A = 6.02 \times 10^{23}$)

33. In a crystalline solid, atoms of X forms FCC packing and the atoms of Y occupy all octahedral voids. If all the atoms along one body diagonal are removed, then the simplest formula of the crystalline solid will be X_aY_b, the value of (a/b) is:

34. The number of following amines, which are relatively more basic than benzyl amine is/are a and the amines which can be easily prepared by Gabriel's phthalimide synthesis is/are b then the value of a/b would be:



35. A chain silicone polymer containing 7 Si atoms is prepared by hydrolysis of $(CH_3)_2SiCl_2$ and $(CH_3)_3SiCl$. The ratio of $(CH_3)_2SiCl_2$ units to $(CH_3)_3SiCl$ units required to prepare that polymer that cannot take part in further condensation reaction, would be?

36. A solution contains 0.6 g urea and 18 g glucose in 100 cc water at 27^oC. If the osmotic pressure of the solution is p bars; then find the value of p. ($R = 0.083$ L bar mol^{-1} K^{-1})

Mathematics

PART – III

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

This section contains **6** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

37. $I = \int_0^1 \int_{f(y)}^1 \left(e^{g(x)}dx\right)dy$, then which of the following is/are correct statement(s)?

(A) for $f(y) = y$ and $g(x) = x^2$ the value of $I = \frac{e-1}{2}$

(B) for $f(y) = y$ and $g(x) = x^3$ the value of $I < \frac{e-1}{2}$

(C) for $f(y) = y^2$ and $g(x) = \sqrt{x}$ the value of $I < \frac{2e}{3}$

(D) for $f(y) = y^2$ and $g(x) = \sqrt{x}$ the value of $I > \frac{2e}{3}$

38. Let p be $\prod_{r=1}^{50} \frac{2r-1}{2r}$, then which of the following is/are correct

(A) $p > \frac{1}{15}$

(B) $p < \frac{1}{10}$

(C) $p < \frac{1}{\sqrt{151}}$

(D) $p > \frac{1}{2}$

39. Let the complex number z be root of the equation $11z^{10} + 10iz^9 + 10iz - 11 = 0$, then which of the following statement(s) is/are correct?

(A) $|z|^2 + |z| + 1 = 3$

(B) $|z|^2 - |z| + 1 = 1$

(C) $|z|^2 + |z| + 1 = 7$

(D) $|z|^2 + |z| + 1 = 8$

40. The number of positive integers of n digits chosen from set {2, 3, 7, 9} which are divisible by 3 is

(A) 22 for n = 3

(B) 23 for n = 3

(C) 86 for n = 4

(D) 342 for n = 5

41. Let $f : [0, 1] \to R$ be a function with continuous second derivative and $f'(x) \in (0, 1]\ \forall\ x \in [0, 1]$. Let $\int_0^x f^2(t)dt = g(x)$, $g(0) = f(0)$, $\int_0^x f^3(t)dt = h(x)$, then for $x \in [0, 1]$

(A) $h(x) \geq g(x)$

(B) $h(x) \leq g(x)$

(C) $f(x) \leq x + \tan^{-1} x$

(D) $f(x) \geq x + \tan^{-1} x$

42. Let ABCD be a rectangle with A(0, 0), B(4, 0), C(4, 4) and D(0, 4). Rectangle is folded in such a way that corner B always lies on line AD, then which of the following statement(s) is/are correct?

(A) As the point B moves on AD the crease thus formed will touch a fixed parabola whose focus is at (4, 0)

(B) As the point B moves on AD the crease thus formed will touch a fixed parabola whose focus is at $\left(\frac{3}{2}, 0\right)$

(C) As the point B moves on AD the crease thus formed will touch a fixed parabola whose equation is $y^2 = 8(x - 2)$

(D) As the point B moves on AD the crease thus formed will touch a fixed parabola whose equation of directrix is $y = 2x$

(Matching List Type)

This section contains **FOUR** questions. Each question has **TWO** matching lists: **LIST - I** and **LIST - II**. **FOUR** options are given representing matching of elements from **LIST - I** and **LIST - II**. **ONLY ONE** of these four options corresponds to a correct matching.

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

	LIST–I		LIST–II
P.	$\lvert A_{4\times3} B_{3\times4}\rvert$ is equal to	1.	1
Q.	If A and B are non-zero square matrices of same order such that AB = 0, then the value of $\lvert A\rvert + \lvert B\rvert + 5$ is equal to	2.	$\frac{1}{9}$
R.	Let A be an 3×3 orthogonal matrix such that AB = BA, then $\lvert AB^T - B^TA + 2I\rvert$ is equal to	3.	0
S.	Let A and B be square matrices of order 3×3 such that $\lvert A\rvert = 1$ and $\lvert B\rvert = 3$, then the value of $\lvert 2A^2B^{-3}\rvert$ is equal to	4.	2^3
		5.	5
		6.	$\frac{8}{27}$

The correct option is:

(A) P → 4; Q → 6; R → 2; S → 1

(B) P → 3; Q → 4; R → 5; S → 6

(C) P → 4; Q → 6; R → 5; S → 2

(D) P → 3; Q → 5; R → 4; S → 6

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

	LIST–I		LIST–II
P.	Any chord of conic $x^2 + y^2 + xy = 1$ passing through origin is bisected at point (p, q), then p + q is equal to	1.	1
Q.	The base BC of ABC passes through the point P(1, 1) and its sides are bisected at right angles by x + y = 0 and x + 2y = 0. The locus of the vertex A is circle with radius equal to r, then $\frac{\sqrt{5}}{r}$ is	2.	5
R.	The circle $x^2 + y^2 - 4x - 4y + 4 = 0$ is inscribed in a triangle which has two of its sides along the coordinate axes. If the locus of circumcentre of triangle is $x + y - xy + \lambda\sqrt{x^2 + y^2} = 0$, then λ is equal to	3.	3

S.	Let P be a point in xy plane, then minimum value of PA + BP + CP + DP is equal to ℓ, then $\frac{\ell}{3}$ is equal to (where A(0, 0), B(4, 3), C(3, 4) and D(–2, 11)	4.	0
		5.	7
		6.	$\sqrt{8}$

The correct option is:
(A) P → 4; Q → 6; R → 2; S → 1
(B) P → 1; Q → 4; R → 2; S → 3
(C) P → 4; Q → 3; R → 1; S → 2
(D) P → 6; Q → 5; R → 6; S → 6

45. Let C be curve represented by equation $5x^2 + 5y^2 - 8xy - 9 = 0$, match the following List-I with List-II

LIST–I		LIST–II	
P.	Area enclosed by curve C is equal to _____ square unit	1.	1
Q.	Let a tangent drawn at point P (other then vertex) on ellipse. If a line AP intersect the line passing through B perpendicular to above tangent at Q, then AQ is equal to (where A(–2, –2), B(2, 2))	2.	3π
R.	If normal drawn at P(lying on C) cuts major axis at G and perpendicular from origin cuts normal at F, then PG·PF is equal to	3.	6
S.	Let the line $y - x = \sqrt{2}$ touches C at P(α, β), then $8(\alpha^2 + \beta^2)$ is equal to	4.	5
		5.	4π
		6.	8

The correct option is:
(A) P → 4; Q → 6; R → 2; S → 1
(B) P → 2; Q → 1; R → 3; S → 6
(C) P → 4; Q → 6; R → 5; S → 2
(D) P → 2; Q → 3; R → 1; S → 6

46. Let the vertices of tetrahedron ABCD be $A(\hat{i}+\hat{j}+\hat{k})$, $B(\hat{i})$, $C(2\hat{i}+\hat{j})$ and $D(\hat{i}+\hat{j})$ respectively, match the following List-I with List-II

LIST–I		LIST–II	
P.	The position vector of the foot of perpendicular drawn from A to the plane BCD is	1.	$\left(\frac{1}{2}\right)(3\hat{i}+\hat{j}+\hat{k})$
Q.	Volume of tetrahedron ABCD is	2.	$\frac{1}{\sqrt{2}}$
R.	The position vector of circumcentre of circum sphere of tetrahedron ABCD is	3.	$\hat{i}+\hat{j}$
S.	Shortest distance between the lines AB and CD is	4.	$\left(\frac{1}{2}\right)(\hat{i}+2\hat{j}+\hat{k})$
		5.	$\frac{1}{6}$
		6.	$\hat{i}+2\hat{j}$

The correct option is:
(A) P → 4; Q → 6; R → 2; S → 1
(B) P → 3; Q → 5; R → 1; S → 2
(C) P → 4; Q → 6; R → 5; S → 2
(D) P → 3; Q → 5; R → 2; S → 1

SECTION – D
(Numerical Answer Type)

This section contains **EIGHT** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. xxxxx.xx).

47. Let $f(x)=\lim\limits_{n\to\infty}\dfrac{3^n\sin x+\left(\sqrt{2}\cos x+2\right)^n+2^n\cos x}{3^n+\cos x\left(\sqrt{2}\cos x+2\right)^n}$, then the value of $\left(\lim\limits_{x\to\frac{\pi}{4}^-}f(x)\right)^4$ is equal to ____

48. $\sum\limits_{m=1}^{\infty}\sum\limits_{n=1}^{\infty}\dfrac{m^2n}{4^m\left(n\cdot4^m+m\cdot4^n\right)}$ is k, then $\left[\dfrac{1}{k}\right]$ is equal to _____ (where [.] denotes the greatest integer function)

49. For each positive integer K, let the point P with abscissa K on curve $y^2 - x^2 = 1$ such that d_K represents shortest distance between P and line y = x, then $4\left(\lim\limits_{K\to\infty}Kd_K\right)^2$ is equal to _____

50. The value of $\prod\limits_{k=0}^{6}\cos\left(\dfrac{\pi}{21}+\dfrac{k\pi}{7}\right)$ is $-\ell$, then the value of 1024ℓ is equal to _____

51. In ΔABC let a = 6, b = 3 and $\tan(A-B)=\dfrac{3}{4}$, if the value of $\dfrac{ab-r_1r_2}{r_3}=\ell$, then the value of $\dfrac{\left(3+\sqrt{5}\right)\ell}{6}$ is equal to _____ (where r_1, r_2 and r_3 are ex-radii of ΔABC)

52. If the area enclosed by the curve $x^4 + y^4 = 2xy$ is equal to A square unit, then the value of $\dfrac{100A}{\pi}$ is equal to _____

53. The largest positive integer n such that $\dfrac{1}{(a+b+c)}\left\{\dfrac{a^2}{\frac{b}{11}+\frac{c}{13}}+\dfrac{b^2}{\frac{c}{11}+\frac{a}{13}}+\dfrac{c^2}{\frac{a}{11}+\frac{b}{13}}\right\}\geq n$ holds for all positive real numbers a, b, c is _____

54. Let α be smallest positive root satisfying $\cos^3 3x + \cos^3 5x = 8\cos^3 4x\cdot\cos^3 x$, then $\cos\alpha$ is equal to _____