FIITJEE

ALL INDIA TEST SERIES

FULL TEST – I

JEE (Advanced)-2019

PAPER –1

Time Allotted: 3 Hours   **Maximum Marks: 264**

General Instructions:

- The test consists of total 60 questions.

- Each subject (PCM) has 20 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 **Three Sections**: **Section-A, Section-B & Section-C.**

  *Section–A (01 – 10, 21 – 30, 41 – 50) contains 30 multiple choice questions which have one or more than one correct answer. Each question carries **+4 marks** for correct answer and **–2 marks** for wrong answer.*

  *Section–B (11 – 12, 31 – 32, 51 – 52) contains 6 Match the following Type questions. Each question having 4 statements in Column I & 5 statements in Column II with any given statement in Column I having correct matching with one or more statement (s) given in Column II. Each statement carries **+2 marks** for correct answer and **–1 mark** for wrong answer.*

  *Section–C (13 – 20, 33 – 40, 53 – 60) contains 24 Numerical based questions with answers as numerical value from **0 to 9** and each question carries **+4 marks** for correct answer. There is no negative marking.*

Physics   PART – I

SECTION – A
(One OR More Than One Choice Type)

This section contains **10 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which only **one or more than one** is/are correct

1. A positive charged particle of charge q and mass m is suspended from a point O by a string of length λ. In the space a uniform horizontal electric field E exists. The particle is drawn aside so that the string becomes vertical and then it is projected horizontally with velocity v such that the particle starts to move along a circle with same constant speed v.
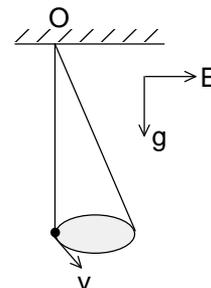
    (A) tension in string is $\sqrt{(mg)^2 + (qE)^2}$

    (B) tension in string is $mg\left[1 + \left(\dfrac{qE}{mg}\right)^2\right]$

    (C) kinetic energy of mass is $\dfrac{q^2 E^2 \ell}{2mg}$

    (D) kinetic energy of mass is $\dfrac{5}{2} m\ell \sqrt{g^2 + \dfrac{q^2 E^2}{m^2}}$

2. One mole of a diatomic gas is taken through a process $A \rightarrow B$ as shown in the figure. The gas obeys the relation
 $Q_{A \rightarrow B} + W_{A \rightarrow B} = O$
    (A) the molar heat capacity for process AB is 5R/4
    (B) the heat supplied in the process is (5/2) $P_o V_o$
    (C) for A to B, temperature initially decreases and then increases
    (D) the temperature goes on increasing from A to B
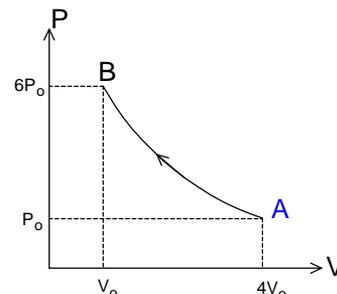
Space for Rough work

3.   In the arrangement shown in the figure, initially the block of mass m, is in limiting equilibrium. The coefficient of friction between the block of mass m_1 and floor is μ. Now the particle of mass m_2 is given a horizontal velocity v_0. The initial distance of the block of mass m_2 from the pulley is ℓ. The masses of pulley and threads are negligible. Choose the correct option(s):
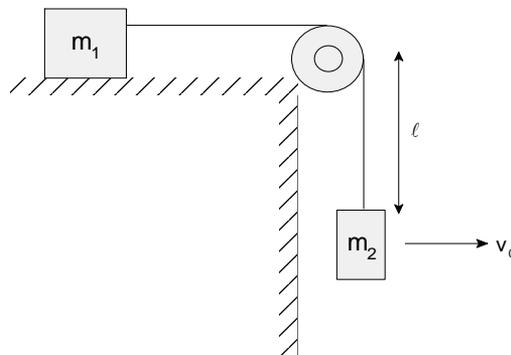
(A) Acceleration of m_1 just after the velocity given is $\left(\dfrac{\mu}{1+\mu}\right)\dfrac{v_0^2}{\ell}$

(B) Acceleration of m_1 just after the velocity given is $\left(\dfrac{\mu}{1+\mu}\right)\dfrac{v_0^2}{2\ell}$

(C) Radius of curvature of path of m_2 just after the velocity given is $\ell(1+\mu)$

(D) Radius of curvature of path of m_2 just after the velocity given is $2\ell(1+\mu)$

4.   In the circuit shown there is steady state with the switch closed. The switch is opened at t = 0. Choose the correct option(s).
$\left(\text{Given}: \varepsilon = 24\,V, C_1 = 3F \text{ and } C_2 = 2F\right)$
(A) The voltage across C_1 before the switch is open, is 12V
(B) The voltage across C_1 after a long time after the switch is open, is 12V
(C) The voltage across C_2 after a long time after the switch is open, is 24V
(D) The voltage across C_2 before the switch is open, is 8V
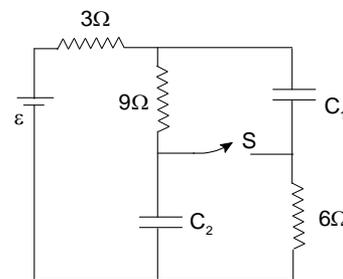
5.   Energy liberated in the de – excitation of hydrogen atom from 3rd level to 1st level falls on a photo-cathode. Later when the same photo – cathode is exposed to a spectrum of some unknown hydrogen like gas, excited to 2nd energy level, it is found that the de – Broglie wavelength of the fastest photoelectrons, now ejected has decreased by a factor of 3. For this new gas, difference of energies of 2nd Lyman line and 1st Balmer line found to be 3 times the ionization potential of the hydrogen atom. Select the correct statement(s):
(A) The gas is lithium
(B) The gas is helium
(C) The work function of photo – cathode is 8.5 eV
(D) The work function of photo – cathode is 5.5 eV

Space for Rough work

6.   The switch S is closed at t = 0 as shown in the figure.
     (A) the current as function of time in the inductor is
          $3(1 - e^{-4t})$A.
     (B) the current through R_1 just after closing of switch
          is 8A
     (C) the power supply by the battery as function of
          time is $36(9 - e^{-4t})$
     (D) the current through R_2 after long time closing of
          switch is 3A
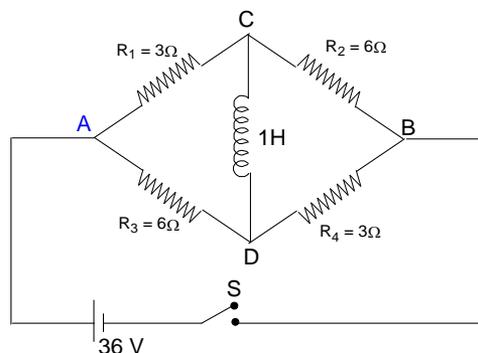
7.   A uniform thin rod AB, 12 m long weighing 24 kg, is supported at
     end B by a flexible light string and a lead weight (of very small
     size) of 12 kg is attached at end A. The rod floats in a river with
     one-half of its length submerged. For this situation, mark out the
     correct statement. [Take g = 10 m/s^2, density of water = 1000
     kg/m^3]
     (A) the tension in the string is 36 g
     (B) the tension in the string is 4 g
     (C) the volume of the rod is 60000 m^3
     (D) the point of application of the buoyancy force is passing
          through C (centre of mass of the rod).
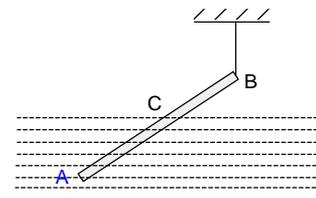
8.   Mark the correct statement(s).
     (A) when a sound wave strikes a wall, the compression pulse is reflected as compression pulse.
     (B) when a sound wave strikes a wall, the compression pulse is reflected as rarefaction pulse.
     (C) when a sound wave is coming out after passing through a narrow pipe, then reflection would
          be there at open end.
     (D) when a sound wave is coming out after passing through a narrow pipe, then compression
          pulse is reflected as rare fraction pulse.

9.   A t = 0, two particles B & C are located at the origin of the coordinate system. Then they start
     moving simultaneously. B moves under a constant acceleration of $2\hat{k}\,m/s^2$ with an initial velocity
     of $8\hat{j}\,m/s$. Particle C moves with constant velocity $\vec{V}_o$ in such a way that B & C collides at t = 4
     sec. Then mark the incorrect statement(s).
     (A) $\vec{v}_o = 8\hat{j} + 4\hat{k}\,m/s$
     (B) position vector of location where two particles collide is $16\hat{i} + 32\hat{k}$ m.
     (C) both (A) & (B) are correct
     (D) It is not possible that B & C collide with each other for any value of $\vec{V}_o$
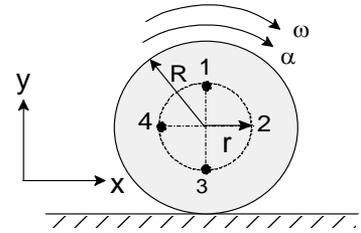
Space for Rough work

10.   A transverse wave travelling on a taut string is represented by:

$y = 0.01 \sin 2\pi(10t - x) \rightarrow$ y and x are in meters and t in seconds. Then

(A) The speed of the wave is 10 m/s

(B) Closest points on the string which differ in phase by 60^0 are (1/6) m apart

(C) Maximum particles velocity is $\pi/4$ m/s

(D) The phase of a certain point on the string changes by 120^0 in (1/20) seconds

SECTION – B
Matrix – Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II.**

11.   A disc of radius R is rolling without slipping with an angular acceleration α, on a horizontal plane. Four points are marked at the end of horizontal and vertical diameter of a circle of radius r (<R) on the disc. If horizontal and vertical direction are chosen as x and y axis as shown in the figure, then acceleration of points 1, 2, 3 and 4 are $\vec{a}_1, \vec{a}_2, \vec{a}_3$ and $\vec{a}_4$ respectively, at the moment when angular velocity of the disc is ω. Match the following

Column – I		Column - II	
(A)	$\vec{a}_1$	(p)	$(R\alpha - r\alpha)\hat{i} + (r\omega^2)\hat{j}$
(B)	$\vec{a}_2$	(q)	$(R\alpha + r\alpha)\hat{i} - (r\omega^2)\hat{j}$
(C)	$\vec{a}_3$	(r)	$(R\alpha - r\omega^2)\hat{i} - (r\alpha)\hat{j}$
(D)	$\vec{a}_4$	(s)	$(R\alpha + r\omega^2)\hat{i} + (r\alpha)\hat{j}$
		(t)	None of these

Space for Rough work

12. A cube of volume 1 m^3 and specific gravity 2 is very slowly being lowered in to a lake with help of a massless string tied to one of its vertices as shown.
Initially the vertex B is just touching the surface of water and finally, vertex A is just beneath the surface of water. For the process of immersion, match the columns: (Ignore change in KE of water). (g = 10 ms^{-2}).
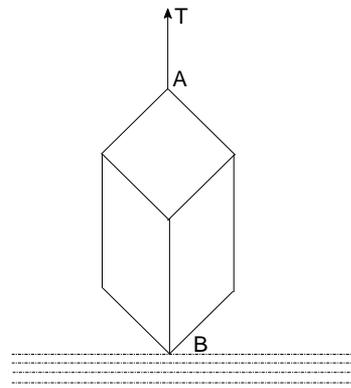

|	Column – I		Column - II
(A)	Work done by gravity on water + cube system	(p)	$\dfrac{3\sqrt{3}}{2} \times 10^4$ Joule
(B)	Work done by tension on the cube	(q)	$\dfrac{-3\sqrt{3}}{2} \times 10^4$ Joule
(C)	Work done by gravity on water	(r)	$\dfrac{\sqrt{3}}{2} \times 10^4$ Joule
(D)	Work done by gravity on the cube	(s)	$2\sqrt{3} \times 10^4$ Joule
		(t)	$40\sqrt{3} \times 10^4$ Joule

SECTION – C
(One Integer Value Correct Type)

This section contains **8 questions**. Each question, when worked out will result in **one integer** from 0 to 9 (both inclusive).

13. A rod is kept at an angle of 60^0 with the horizontal by the help of a string in vertical plane. The string is now cut at t = 0. Find the force (in N) applied by upper half section of the rod AC on the lower half section of the rod BC just after t = 0. (Take mass of the rod $= \dfrac{16}{9}$ kg and g = 10 m/s^2)
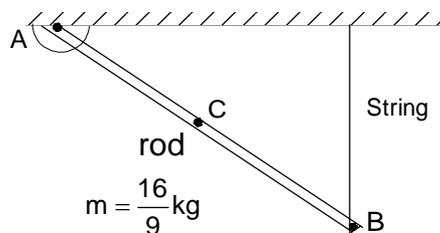
Space for Rough work

14. A man crosses a river of width d. Current flow speed is v. Speed of swimmer relative to water is v. Man always heads towards the point exactly opposite to the starting point at the another bank (relative to water). If radius of curvature of the path followed by the swimmer just after he start swimming is $n\sqrt{2}d$, then the value of n is.

15. The following measurement are obtained on a single phase load V = 220 V $\pm 1\%$. I = 5.0 A $\pm 1\%$ and W = 555 W $\pm 2\%$. If the power factor is calculated using these measurements, the worst case error in the calculated power factor in percent is_____. (Give answer up to one decimal place.)

16. A small ball of density $4\rho_o$ is left from the surface of liquid. The density of liquid varies as $\rho = \rho_o(1+ay)$, where y is height of liquid from the surface and ρ_o, a are constants. The time-period of oscillation of ball is found to be $\dfrac{2\pi}{\sqrt{K}}$ sec. Find K [a = 2 m^{-1}, g = 10 ms^{-2}]. Neglect viscosity]

17. The volume of glass vessel is 1000 cc at 20^{0}C. What volume of mercury should be poured into it at this temperature so that the volume of the remaining space does not change with temperature is 10 n cc. Coefficient of cubical expansion of mercury and glass are $1.8\times10^{-4}/^0C$ and $9.0\times10^{-6}/^0C$ respectively. Find the value of n?

18. A smooth narrow semicircular tube (in vertical plane) contains a small ball of mass m at its top as shown. System is initially at rest and now ball is slightly pushed to its right such that system starts moving. If the acceleration of the tube just before the ball hits the floor is $\dfrac{4g}{\eta}$, find η. (Take mass of tube = 2 m and neglect the break-off of the tube from floor)
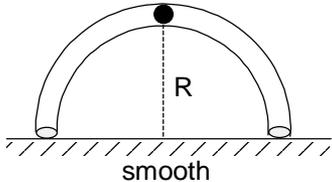
19. A gas containing hydrogen like ions with atomic number z, emits photons in transition (n + 2) $\rightarrow$ n, where n = z. These photons fall on a metallic plate and eject electrons having minimum de-broglie wavelength λ of 5 Å. Find the value of 'z' if the work function of metal is 4.2 eV. [Take h = 6.625 × 10^{-34} J-s, mass of electron = 9.1 × 10^{-31} kg]

20. A ray is incident on a glass sphere as shown. The opposite surface of the sphere is partially silvered. The net deviation of the ray transmitted at the partially silvered surface is 1/3rd of the net deviation suffered by the ray reflected at the partially silvered surface (after emerging out of the sphere). The refractive index of the sphere is $\sqrt{n}$. Find n.
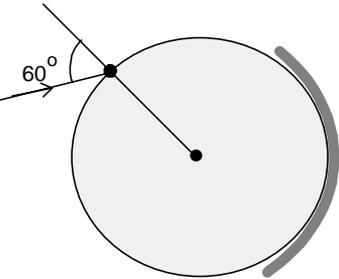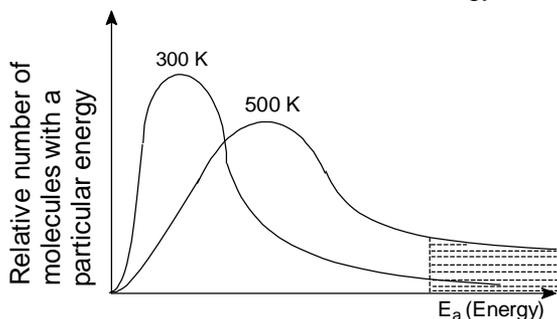

Space for Rough work

Chemistry   **PART – II**

SECTION – A
(One OR More Than One Choice Type)

This section contains **10 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which only **one or more than one** is/are correct

21. The distribution of molecular kinetic energy at two temperature is as shown in the following graph.

Which of the following conclusions are correct ?
(A) The number of molecules with energy E_a or greater is proportional to the shaded area for each temperature.
(B) The number of molecules with energy E_a or less is proportional to the shaded area for each temperature.
(C) The number of molecules with energy E_a is the mean of all temperatures.
(D) The graph follows the Maxwell – Boltzmann energy distribution law.

22. How much charge must be supplied to a cell for the electrolytic production of 245 gram $NaClO_4$ from $NaClO_3$? Because of the side reaction, the anode efficiency for the desired reaction is 60 %.
(A) $6.43 \times 10^5 C$ (B) 6.67 F
(C) $6.43 \times 10^6 C$ (D) 66.7 F

23. In which of the following pairs of solutions will the values of the van't Hoff factor be the same ?
(A) 0.05 M $K_4\left[Fe(CN)_6 \right]$ and 0.10 M $FeSO_4$
(B) 0.10 M $K_4\left[Fe(CN)_6 \right]$ and 0.05 M $FeSO_4\left(NH_4\right)_2 SO_4.6H_2O$
(C) 0.20 M NaCl and 0.10 M $BaCl_2$
(D) 0.05 M $FeSO_4\left(NH_4\right)_2 SO_4.6H_2O$ and 0.02 M $KCl. MgCl_2.6H_2O$

Space for Rough work

24.   Which of the following crystals have 8 : 8 coordination ?
       (A) NH_4Cl (B) AlFe
       (C) MnO   (D) NH_4Br

25.   On treatment of hard water with zeolite, sodium ions get exchanged with
       (A) Ca^{2+} ions   (B) H^+ ions
       (C) Mg^{2+} ions   (D) OH^- ions

26.   Which of the following statement/s is/are correct?
       (A) Boric acid is a hydrogen – bonded molecule.
       (B) Boric acid combines with CuO to give metaborate in the borax bead test.
       (C) Al_2O_3 is more acidic than B_2O_3.
       (D) Al_2O_3 is amphoteric and B_2O_3 is acidic.

27.   Nitrous oxide is prepared by
       (A) Heating a mixture of NH_4Cl and $NaNO_3$
       (B) Heating a mixture of NH_4Cl and $NaNO_2$
       (C) The hydrolysis of Mg_3N_2
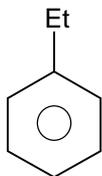   (D) Heating a mixture of nitric oxide and sulphur dioxide

28.
$$CH\equiv CH + 2CH_3COOH \xrightarrow[\text{2. } \Delta \text{ (300 - 400}^0\text{C)}]{\text{1. } Hg^{2+}} \text{Products}$$

       (A) $CH_3-CH(OCOCH_3)_2$
       (B) CH_3CHO
       (C)
$$CH_3-\overset{\overset{\displaystyle O}{||}}{C}-O-CH_3$$
       (D)
$$CH_3-\overset{\overset{\displaystyle O}{||}}{C}-O-\overset{\overset{\displaystyle O}{||}}{C}-CH_3$$
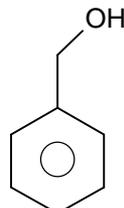
Space for Rough work

29.   Benzoic acid may be prepared by the oxidation of
        (A) Et   (B)   OH

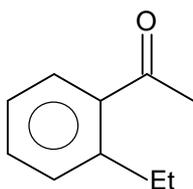   (C)   O   (D)   OH
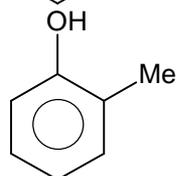
                                                              Me

30.   The final product of the reaction is

        $(CH_2)_5$ with CH_2 and CH_2 groups, $C=O$

        $\xrightarrow[\text{2. KOH/}\Delta]{\text{1. PCl}_5}$

        (A) $(CH_2)_5$ with CH_2, CH_2 and C bearing OH and OH

        (B) $(CH_2)_5$ with CH_2 and $C \equiv C$
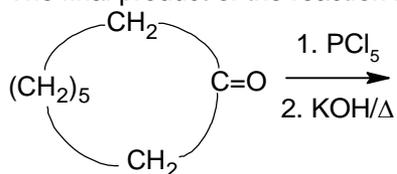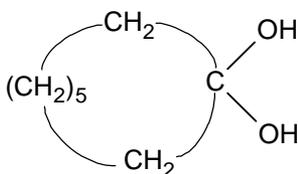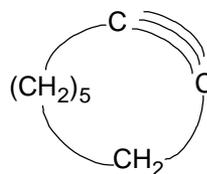
        (C) $(CH_2)_5$ with $CH = CH$ and C

        (D) The starting compound is recovered

Space for Rough work

SECTION – B
Matrix – Match Type

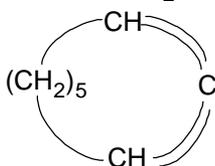This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II.**

31.   Match the Column – I with Column – II.

	Column I		Column II
(A)	Molten $PbCl_2$ using inert electrode	(p)	Metal of salt will reduced
(B)	NaCl solution using inert electrode	(q)	$2H_2O + 2e^- \longrightarrow H_2(g) + 2OH^-$
(C)	Silver nitrate solution using Ag electrode	(r)	Solution becomes basic after electrolysis
(D)	Sodium nitrate solution using inert electrode	(s)	Solution becomes acidic after electrolysis
		(t)	Solution becomes neutral after electrolysis

32.   Match the Column – I with Column – II.

	Column I		Column II
(A)	$\left[Cr(CN)_3 (NO_2)_3 \right]^{4-}$	(p)	Outer orbital complex
(B)	$\left[Co(C_2O_4)_3 \right]^{3-}$	(q)	Inner orbital complex
(C)	$\left[Fe(EDTA) \right]^-$	(r)	$\mu = 2.83 BM$
(D)	$\left[Ni(en)_3 \right](NO_3)_2$	(s)	Shows optical activity
		(t)	$\mu = 0$

Space for Rough work

SECTION – C
(One Integer Value Correct Type)

This section contains **8 questions**. Each question, when worked out will result in **one integer** from 0 to 9 (both inclusive).

33. Find number of basic radicals among the following cations, which can form soluble complex on adding excess of NH_3 solution.

$$Pb^{2+}_{(aq)}, Cd^{2+}_{(aq)}, Mn^{2+}_{(aq)}, Ni^{2+}_{(aq)}, Fe^{3+}_{(aq)}, Zn^{2+}_{(aq)}, Ag^{+}_{(aq)}$$
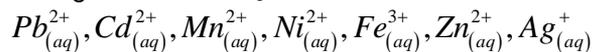
34. In the following molecule
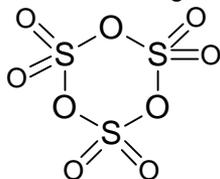
    If x is the total number of dπ – pπ bonds and y is the total number of sp^3 hybridized atoms. Find the value of $\dfrac{x}{y}$?

35. How many moles of CH_3MgBr will consume when it reacts with following compound

Space for Rough work

36.   Calculate total number of aromatic species in following
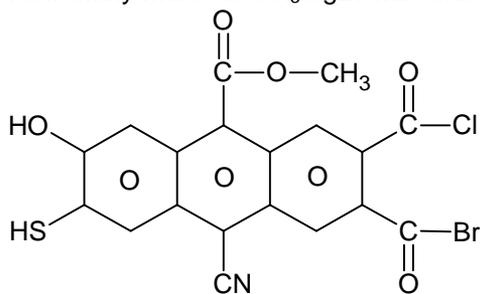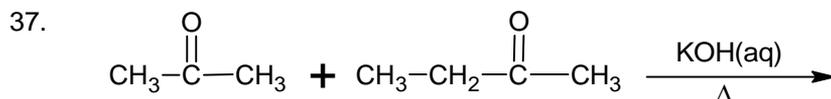

37.
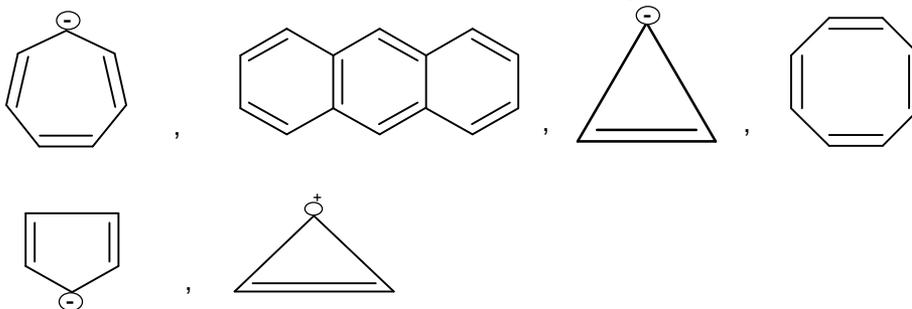
Calculate total number of aldol condensation product (s) including stereoisomers.

38.   The total number of α & β particles emitted in the nuclear reaction $^{238}_{92}U \longrightarrow ^{214}_{82}Pb$

39.   In 1 litre saturated solution of $AgCl\left[K_{SP}\left(AgCl\right) = 1.6 \times 10^{-10} \right]$, 0.1 mol of CuCl [$K_{sp}$(CuCl) = 1.0×10^{-6}] is added. The resultant concentration of Ag$^+$ in the solution is 1.6×10^{-x}. The value of "x" is.

40.   A gas diffuse $\dfrac{1}{5}$ times as fast as hydrogen. If its molecular mass is 10 y. What is the value of y.

Space for Rough work

Mathematics   **PART – III**

SECTION – A
(One OR More Than One Choice Type)

This section contains **10 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which only **one or more than one** is/are correct

41.   A square matrix 'A' of order 3, satisfies the relation $A^3 - 6A^2 + 7I = 0$, where I is unit matrix of order 3. Which of the following are correct
        (A) trace of the matrix A is 6   (B) det(A) = 6
        (C) trace of the matrix A is – 7   (D) det(A) = –7

42.   From a variable point P, normal are drawn to the hyperbola xy = 16. If sum of slopes of normal is equal to the sum of ordinates & abscissas of feet of normal, then the locus of point P is the curve 'C'. Which of the following are correct.
        (A) 'C' is a parabola of length of latus rectum 16
        (B) 'C' is an ellipse of length of latus rectum 16
        (C) 'C' is a hyperbola of length of latus rectum 16
        (D) focus of 'C' is at (8, 0)

43.   Five fair dice are tossed. Which of the following are true
        (A) mean of no. of dice showing even nos. is 2.5
        (B) varience of no. of disc showing even nos. is 1.25
        (C) probability that same nos. appeared on all the 5 dice is $\dfrac{1}{6^4}$
        (D) probability that atleast two dice show even number, if atleast one die show even number is $\dfrac{26}{31}$

44.   Solution of the differential equation $x\left[y\ln x - y\ln y - x - y\right]dy = y\left[x\ln y - x\ln x - y - x\right]dx$; y(1)=e
        is $ay\ln\left(\dfrac{x}{y}\right) = bx\ln\left(\dfrac{y}{x}\right) - ce + d$ where a, b, c & d are integers. Which of the following are correct
        (A) a + b = 2   (B) ab + c + d = 1
        (C) ab + bc + cd + ad + bd + ac = 0   (D) a + b + c + d = 2

Space for Rough work

45. If $g(x) = \lim\limits_{n \to \infty} n \left[x^{\frac{2018}{n}} - x^{\frac{2019}{n}} \right]$; $x > 0$ then choose the correct option(s)

    (A) the number of solution(s) of the equation $g(|x|) = e^{-2019x^2}$ is 2

    (B) the number of solution(s) of the equation $g(|x|) = e^{-2019x^2}$ is 2

    (C) the number of solution(s) of the equation $g(x) = e^{2018}$ is 1

    (D) the number of solution(s) of the equation $g(x) = e^{-2018}$ is 1

46. For fixed positive λ the locus of the point z satisfying the equation |3z − i| = λ|z + 2| can be
    (A) a straight line   (B) a circle
    (C) a rectangular hyperbola   (D) an ellipse

47. If $g(x, y) = 2x^2 - (\lambda + 1)xy - \lambda y^2$ be an orthogonal pair if straight lines and a point (h, k) (h, k $\in$ z) lies on the curve g(x, y) = 7, then
    (A) value of λ is − 2   (B) value of λ is 2
    (C) possible value of h + k is − 4   (D) possible value of h + k is 4

48. N is the number of ways in which 8 different books can be distributed among 3 students, if each student receives at least 2 books. Then N is divisible by
    (A) 2   (B) 3
    (C) 4   (D) 5

49. Six people $(P_1 P_2 P_3 P_4 P_5 P_6)$ are going to sit in a row on a bench. $P_1 \& P_2$ are adjacent. P_3 doesn't want to sit adjacent to P_4. P_5 and P_6 can sit anywhere. Number of ways in which these six people can be seated, is less or equal to
    (A) 200   (B) 144
    (C) 120   (D) 56

50. Plane 'π' meets the co-ordinate axes (X, Y & Z axes respectively) at A, B & C. If areas of $\triangle OAB, \triangle OBC \& \triangle OCA$ are 3, 6 & 4 units respectively. Now which of the following are correct.

    (A) Area of $\triangle ABC = \sqrt{61}$ Square unit
    (B) Equation of plane 'π' may be $6x - 4y + 3z = 12$
    (C) Equation of plane 'π' may be $6x + 4y - 3z = 12$
    (D) Volume of tetrahedron OABC is 2 unit

Space for Rough work

SECTION – B
Matrix – Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II.**

51. Match the following:-

	Column – I		Column – II
(A)	Let $\vec{P} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{q} = \hat{i} + 3\hat{k}$. If $\vec{r}$ is an unit vector and μ is the maximum value of $\left[\vec{p}\ \vec{q}\ \vec{r}\right]$. Then the value of $\mu^2 - 57$ is	(p)	1
(B)	The value of $t \in R$ for which the vectors $\vec{a} = (1,-2,3), \vec{b} = (-2,3,-4), \vec{c} = (1,-1;\ t)$ form a linearly dependent system	(q)	2
(C)	If the area of the parallelogram whose diagonals are $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$ is $\mu\sqrt{3}$ sq. unit, then the value of μ is	(r)	3
(D)	Let $\vec{p} = \hat{i} + \hat{j}; \vec{q} = \hat{i} - \hat{j}$ and $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k}$ if $\vec{x}$ is an unit vector such that $\vec{p}.\vec{x} = 0$ and $\vec{q}.\vec{x} = 0$ then $\left|\vec{r}.\vec{x}\right|$ is equal to	(s)	4
		(t)	5

52. Match the following:-

	Column – I		Column – II
(A)	If $I = \int_0^{\frac{\pi}{4}} \sin^3 x.\cos^3 x\, dx$, then I^{-1} is divisible by	(p)	1
(B)	If $I = \int_0^{2\pi} [2\sin x]\, dx$, then $\|I\|$ is divisible by ([.] is GIF)	(q)	2
(C)	If $I = \int_{-2}^{2} \text{sgn}(x-1)\, dx$, then $I + N$ can be equal to (N be a natural no., sgn(.) is signum function)	(r)	4
(D)	$I = \int_0^1 \frac{x^3 - 1}{x+1}\, dx$; then $\left[\left|-2I - \ln 16\right|\right]$ is divisible by ([.] is GIF)	(s)	8
		(t)	16

Space for Rough work

SECTION – C
(One Integer Value Correct Type)

This section contains **8 questions**. Each question, when worked out will result in **one integer** from 0 to 9 (both inclusive).

53.   A variable point 'p' moving inside a square whose co-ordinates of vertices are (1, 1), (-1, 1), (-1, -1) & (1, -1) in such a way that 'p' is closer to the diagonals of square compare to the co-ordinate axes. If A is the area of the region transversed by p the [A] is ([·] is GIF)

54.   If $\int_1^e \dfrac{x^3 \ln x + 2}{x^3 \ln x + x} dx = \dfrac{e^2 + a}{b} - \ln\left(e^2 + 1\right)$ where a & b are positive integers. Then value of a + b is

55.   The number of real roots of $(6 - x)^4 + (8 - x)^4 = 16$ is

56.   Number of points on the ellipse $\dfrac{x^2}{2} + \dfrac{y^2}{10} = 1$ from which perpendicular tangents can be drawn to the hyperbola $\dfrac{x^2}{6} - \dfrac{y^2}{2} = 1$ is

57.   Number of principal solution(s) of the equation $\sin x + \cos x + \sin 2x + \cos 2x + \sin 3x = -1$ is

58.   'K' is a three digit number which is no. of ways of distributing 10 identical balls in 5 different boxes such that no. two adjacent boxes remain empty. 'P' is prime number by which sum of digits of 'K' is divisible. The value $\left(P_{\max} - P_{\min}\right)$ is

59.   The sum of the coefficients of all the even powers of x in the expansion of $(2x^2 - 3x + 1)^{11}$ is $P_1^m P_2^n$ where P_1 & P_2 are prime numbers, $P_1 < P_2$ and m & n are positive integers. The value of $\dfrac{P_1 + P_2}{n - m}$ is

60.   I(α, r) is the intercept made by the circle $|z|^2 + \overline{\alpha}z + \alpha\overline{z} + r = 0$ on the real axis on complex plane, where r is a real number and α may be real. The value of $I\left(\dfrac{5}{2} + i, 4\right)$ is

Space for Rough work