

FIITJEE

ALL INDIA TEST SERIES

FULL TEST – IX

JEE (Advanced)-2021

PAPER –2

TEST DATE: 11-09-2021

Time Allotted: 3 Hours

Maximum Marks: 198

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 **Three Sections: Section-A, Section – B & Section-C**.

Section-A (01 – 06, 19 – 24, 37– 42) this section contains **18 multiple** choice questions. Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s)

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

Full Marks : +4 If only (all) the correct option(s) is (are) chosen:

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen and both of which are correct;

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i. e. the question is unanswered);

Negative Marks : –2 In all other cases

Section-B (07 – 12, 25 – 30, 43– 48) contains **18 Numerical** based questions with **Single digit integer** as answer, ranging from **0 to 9** and each question carries **+3 marks** for correct answer and **–1 mark** for wrong answer.

Section-C (13 – 18, 31 – 36, 49– 54) contains **18 Numerical** answer type questions with answer **XXXXX.XX** and each question carries **+4 marks** for correct answer and **0 marks** for wrong answer.

Physics

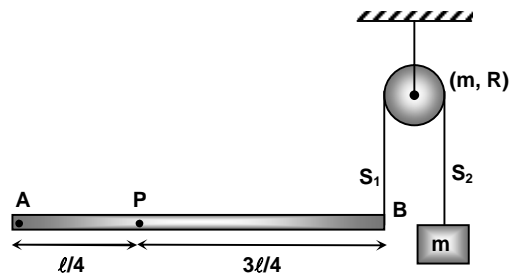
PART – I

SECTION – A

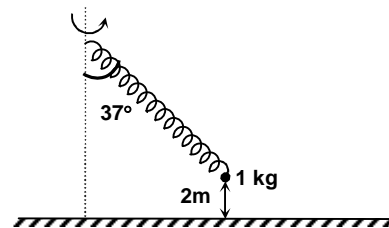
(One or More than one correct type)

This section contains **06** multiple choice questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

1. A uniform rod of mass m and length ℓ is hinged at point P such that the rod can rotate in a vertical plane. One end B of the rod is connected through the massless string which passes over the pulley of mass m and radius R and the other end of the string is connected with the block of mass m as shown in the figure. (There is no slipping between the string and the pulley) Initially rod is horizontal. At $t = 0$, the system is released, then which of the following is/are correct.



- (A) Acceleration of the block is $\frac{36}{95}g$.
- (B) Acceleration of the centre of mass of the rod is $\frac{12}{95}g$.
- (C) Tension in the string S_1 is $\frac{41}{95}mg$
- (D) Tension in the string S_2 is $\frac{39}{95}mg$
2. A ball of mass 1 kg swings around in a circle using a light spring which has spring constant 10 N/m. The ball describes a horizontal circle at a height 2m above the floor. The stretched spring has a length 5m and makes an angle 37° with the vertical as shown in the figure. Then which of the following is/are correct. (Take $g = 10 \text{ m/s}^2$)
- (A) The magnitude of the force F that the spring exerts on mass is 12.50 N.
- (B) The length of the spring when it is not stretched is 3.75 m.
- (C) The speed of the ball is $(1.5\sqrt{10}) \text{ m/s}$
- (D) At some instant of time the spring breaks. The ball moves a horizontal distance 3m before it hits the floor from breaking point.
3. A smooth sphere of mass 8 kg is moving on a horizontal plane with a velocity $(3\hat{i} + \hat{j}) \text{ m/s}$, it collides with a vertical wall which is parallel to the y - z plane. If the coefficient of restitution between the sphere and the wall is $\frac{1}{2}$. Then which of the following is/are correct.
- (A) The velocity of sphere after impact is $\left(-\frac{3}{2}\hat{i} + \hat{j}\right) \text{ m/s}$.
- (B) The loss in kinetic energy caused by the impact is 27 joule.
- (C) The impulse \vec{J} that acts on the sphere is $-36\hat{i} \text{ N-sec}$.
- (D) The impulse \vec{J} that acts on the sphere is $36\hat{i} \text{ N-sec}$.



4. A circular disc of mass 'm' and radius 'R' is held in equilibrium in a vertical plane by two identical strings 'S₁' and 'S₂' of negligible mass as shown in the figure. Choose the correct option(s).

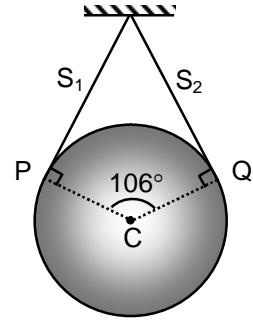
(A) Tension in the string S₂ when circular disc is in equilibrium

is $\frac{5}{8}mg$.

(B) Acceleration of point P just after cutting the string S₂ is $\frac{3}{5}g$.

(C) Tension in the string 'S₁' immediately after cutting the string 'S₂' is $\frac{4mg}{15}$.

(D) Tension in the string 'S₁' immediately after cutting the string 'S₂' is $\frac{8mg}{15}$.



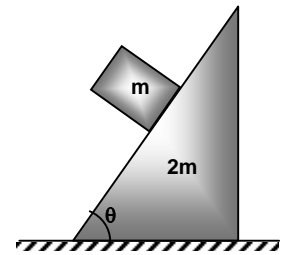
5. A block of mass m is kept on a inclined plane of mass 2m and inclination θ with horizontal. If the whole system is accelerated such that the block does not slip on the wedge. Then which of the following is/are correct (all the surfaces are frictionless).

(A) The normal reaction acting on 2m due to m is $mg \sec\theta$.

(B) If m remains at rest with respect to wedge a force $F = 3mg \tan\theta$ must be applied on 2m.

(C) The acceleration of wedge must be $g \tan\theta$.

(D) Pseudo force acting on m with respect to ground is $mg \tan\theta$ towards left.



6. The potential energy U in joule of a particle of mass 1 kg moving in xy plane obeys the law $U = (3x + 4y)$, where (x, y) are the coordinates of the particle in meter. If the particle is at rest at (6, 4) at time $t = 0$, then choose the correct option(s)

(A) The particle has constant acceleration

(B) The particle has zero acceleration

(C) The speed of the particle when it crosses y-axis is 10 m/s

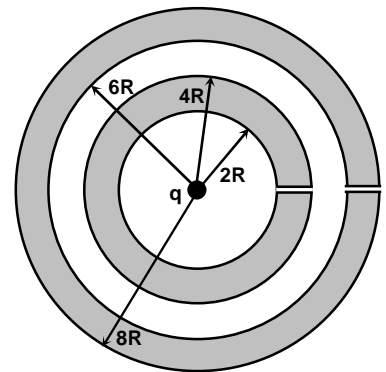
(D) Co-ordinates of the particle at $t = 1$ sec are (4.5, 2)

SECTION – B (Single Digit Integer Type)

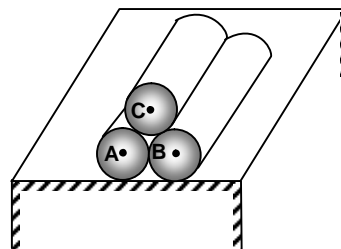
This section contains **06** questions. The answer to each question is a **Single Digit integer** ranging from **0** to **9**, both inclusive.

7. A charge particle 'q' lies at the centre of two concentric hollow spheres of inner radii 2R and 6R and outer radii 4R and 8R respectively. The amount of work has to be performed to slowly transfer the charge 'q' from center through the orifice to infinity

is $\frac{\lambda}{192} \frac{q^2}{\pi\epsilon_0 R}$. Find the value of λ .

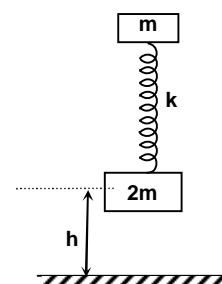


8. Radius of cylinder A and B are same and equal to $4R$ while the radius of cylinder C is R . All three cylinders are released from rest. Magnitude of acceleration of cylinder A is a_1 and that of cylinder C is a_2 . If the ratio of $\frac{a_1}{a_2}$ is $\frac{k}{4}$, then find the value of k . (all the surfaces are frictionless)

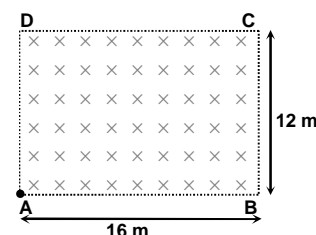


9. A particle travels in a straight line such that for a time interval $2 \leq t \leq 6$ sec its motion is described by $v = \frac{4}{a} m/s$, where a is in m/s^2 . If $v = 6 m/s$ at $t = 2$ sec, then the particle's acceleration at $t = 5$ sec is $\sqrt{\frac{k}{15}} m/s^2$. Find the value of k .

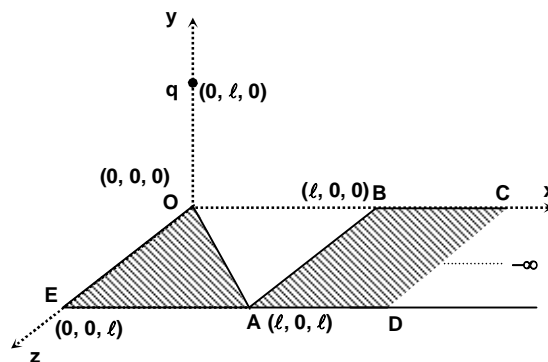
10. A spring mass system is held at rest with the spring relaxed at a height 'h' above the ground. The minimum value of $h = \frac{\lambda mg}{k}$ for which the system has a tendency to rebound after hitting the ground, then find the value of λ . (assume zero coefficient of restitution for lower block and ground)



11. A charged particle of mass $m = 10$ gm and charge $q = 24 \times 10^{-6}$ C enters along AB at point A in a uniform magnetic field of magnitude $B = 200$ Tesla existing in a rectangular region of size $(16m \times 12m)$ and into the plane of paper as shown in figure. The particle leaves the region at 'C'. The speed of the charge particle (in m/s) as it leaves the region is



12. A point charge 'q' is placed at a distance 'l' (on the y-axis) vertically above the surface which lies in the xz plane as shown in the figure. The flux of electric field passing through the shaded portion is $\frac{\lambda q}{48\epsilon_0}$. Find the value of λ .

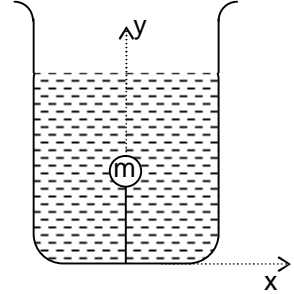


SECTION – C
(Numerical Answer Type)

This section contains **06** 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).

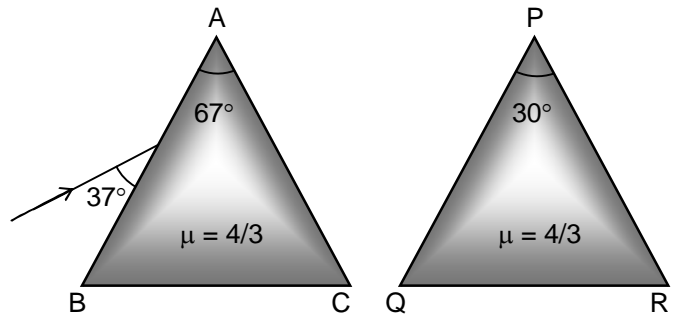
13. A ray of light is refracted through a solid sphere in such a way that it passes through the extremities of two radii which makes an angle 120° with each other and the deviation of the ray caused by its passage through the sphere is 46° . Then find the refractive index ' μ ' of the sphere (material).

14. A very large container filled with a liquid of density ρ and a spherical ball of mass ' m ' is in equilibrium with the help of a string as shown in the figure. The density of ball is $\rho/2$ and its volume is V . Container starts accelerating with acceleration $\vec{a} = (5\sqrt{3}\hat{i} - 5\hat{j}) \text{ m/s}^2$. Find the magnitude of tension (in newton) in the string in equilibrium. (Take $g = 10 \text{ m/s}^2$ and $m = 2.5 \text{ kg}$)



15. A coil of inductance $L = 5\text{H}$ and resistance $R = 55 \Omega$ is connected in series to the mains alternating voltage of frequency $f = 50 \text{ Hz}$ in series. The non-zero capacitance of capacity $K \times 10^{-8} \text{ F}$ is connected in series with the coil, if the power dissipated has to remain unchanged, then find the value of K . (Take $\pi^2 = 10$)
16. The main scale of vernier callipers reads in millimeter and its vernier is divided into 8 divisions, which coincide with 6 divisions of main scale. When two jaws of instrument touch each other the zero of the vernier coincide with the zero of main scale. A rod is tightly placed along its length between both jaws, it is observed that the zero of vernier scale lies just right to 45^{th} division of main scale and seventh division of vernier scale coincides with the main scale. Then find the length of the rod in millimeter.

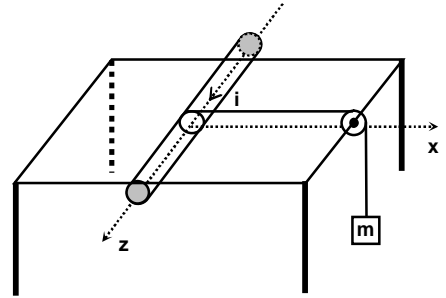
17. A light ray is incident on the edge face AB of a prism ABC as shown in the figure. The second prism is kept in such a manner that emergent ray from prism ABC is falling normally on face PQ of prism PQR . Find the net deviation (in degree) produced in the light ray by the optical system of two prisms.



(Take $\sin^{-1}\left(\frac{3}{5}\right) = 37^\circ$ and

$\sin^{-1}\left(\frac{2}{3}\right) = 42^\circ$)

18. A block of mass ' m ' = 5 kg connected with massless string through the ideal pulley with a conducting rod of length ' ℓ ' = 10 meter and mass ' m ' = 5 kg lies on the horizontal table. Coefficient of friction between the rod and the table is ' μ ' = $\left(\frac{3}{4}\right)$. If the current in the conductor is 2 ampere, then find the minimum magnitude of magnetic field strength (in Tesla) such that conducting rod just starts to translate along negative x-axis. (take $g = 10 \text{ m/sec}^2$) [neglect the radius of rod]



Chemistry

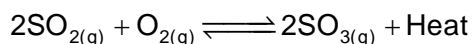
PART – II

SECTION – A

(One or More than one correct type)

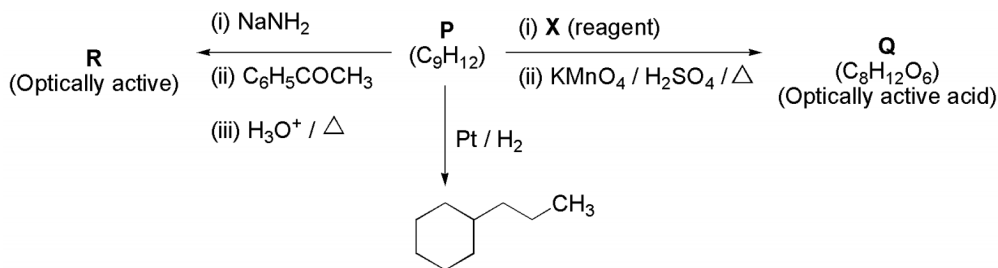
This section contains **06** multiple choice questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

19. Consider the reaction

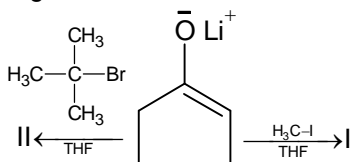


What will happen if 0.5 mole of Helium gas is introduced into the vessel so that the temperature and pressure remain constant?

- (A) the equilibrium concentration of SO_2 increases
 (B) the equilibrium will shift to right
 (C) the equilibrium concentration of O_2 decreases
 (D) equilibrium constant will increase
20. Consider the following transformations of a compound P. choose the correct options

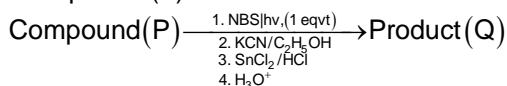


- (A) The compound R has only one stereogenic centre.
 (B) X is Pd-C/quinoline/ H_2
 (C) Q is tricarboxylic acid having word root of 5 carbon.
 (D) correct order of DU is $\text{R} > \text{P} > \text{Q}$.
21. The lithium enolate base from cyclohexanone reacts with alkyl halides, often in different ways. As shown here, methyl iodide and *tert*-butyl bromide react to give different organic products, I and II, together with lithium halides. What are the products from these reactions?



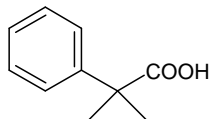
- (A) I will give positive iodoform test.
 (B) II can give tollen's test as well as iodoform test after reaction with $\text{Zn}/\text{H}_2\text{O}/\text{O}_3$.
 (C) I is 2-methylcyclopentanone
 (D) II is a mixture of cyclopentanone and 2-methylpropene
22. In which of the following reactions the hybridization of underlined atom changes in the corresponding product?
- (A) $\text{Na}\underline{\text{B}}\text{O}_2 + \text{H}_2\text{O}_2 + \text{H}_2\text{O} \longrightarrow$
 (B) $\text{B}_2\text{H}_6 + \underline{\text{N}}\text{H}_3 \xrightarrow{\Delta}$
 (C) $\text{Ph}\underline{\text{N}}\text{H}_2 + \text{H}_2\text{SO}_4 \longrightarrow$
 (D) $\text{NaF} + \underline{\text{B}}\text{Cl}_3 \longrightarrow$

23. α -phenyl ethylacetate is treated with diethyl carbonate in the presence of sodium ethoxide to produce the compound (X). compound (X) on further treatment with sodium ethoxide and methyl iodide gives (Y). Compound (Y) on hydrolysis followed by heating gives compound (Z). Compound (Z) on treatment with red P/HI gives (P).

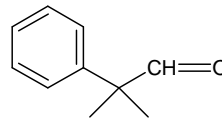


Hence, the product (Q) is:

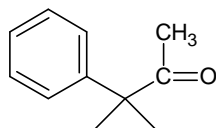
(A)



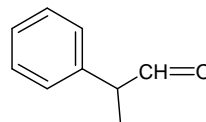
(B)



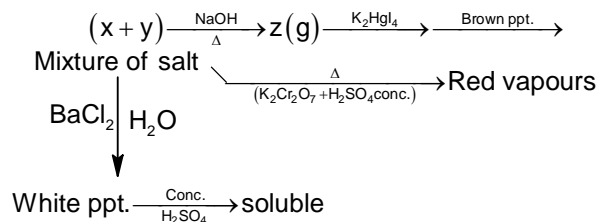
(C)



(D)



- 24.



The aqueous solution of the mixture gives a deep blue coloration with $[\text{K}_3\text{Fe}(\text{CN})_6]$ solution:

Choose the correct statements:

- (A) Mixture may contains radicals NH_4^+ , Cl^- , Fe^{+2} and SO_4^{--}
 (B) Oxidation state of Fe in deep blue compound is (+3) only
 (C) Red vapours is due to CrO_2Cl_2 formation and gas (z) is NH_3
 (D) White ppt. is due to BaSO_4 formation

SECTION – B (Single Digit Integer Type)

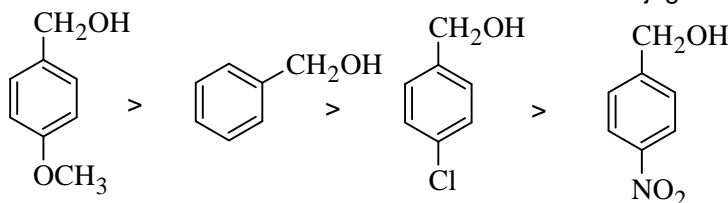
This section contains **06** questions. The answer to each question is a **Single Digit integer** ranging from **0 to 9**, both inclusive.

25. Alkaline hydrolysis of chloral hydrate produces a compound (A) which is used as a solvent and preservative for anatomical specimens and also has anesthetic properties. (A) is prone to aerial oxidation in presence of sunlight to give a poisonous compound (B) which may be made non poisonous by adding dilute solution of ethanol which converts it into a non poisonous compound (C) which react with excess of CH_3MgBr followed by acidic hydrolysis to give alcohol number of carbon in end product alcohol are.....
26. An inorganic mixture containing 1 mole of PCl_3 and 0.5 mole of PCl_5 was dissolved in excess of water. Number of moles of NaOH required to completely neutralise the resulting solution is:
27. Some polymers are given below:
 PVC, Orlon, Dacron, Polymethyl acrylic acid (PMAA), Polymethyl methacrylate (PMMA), Buna-S-rubber, Neoprene, Bakelite, Glyptal, Nylon-6, Gutta percha rubber.
 How many of these are "HOMOPOLYMERS"?

28. The 1st, 2nd, and the 3rd ionization enthalpies, I_1 , I_2 , and I_3 , of four atoms with atomic numbers n , $n+1$, $n+2$, and $n+3$, where $n < 10$, are tabulated below. What is the number of unpaired electrons present in the atom having atomic number n ?

Atomic number	Ionization Enthalpy (kJ/mol)		
	I_1	I_2	I_3
n	1681	3374	6050
$n+1$	2081	3952	6122
$n+2$	496	4562	6910
$n+3$	738	1451	7733

29. An organic compound ($C_8H_{10}O_2$) rotates plane-polarized light. It produces pink colour with neutral $FeCl_3$ solution. If n is/are the total number of all the possible isomers for this compound is subjected to oxidation with PCC/ CH_2Cl_2 solution produced another compound ($C_8H_8O_2$) has m isomers which gives yellow ppt. with I_2+NaOH . Calculate the value of " $m+n$ ".
30. How many statements is/are true in the given list of statements?
- (i). orthoboric acid does not act as a proton donor but behaves like a Lewis acid by accepting OH^- ion.
- (ii). orthoboric acid is prepared by the action of mineral acid on borax solution.
- (iii). orthoboric acid has a layer structure in which hydrogen bonds unite $B(OH)_3$ units.
- (iv). If the number of revolutions made by electron in 1.0 s in H atom in its n^{th} orbit is twice of the number of revolution made by electron in 1.0 s in the 2^{nd} orbit of H-atom, then n is 1.
- (v). $K_2CrO_4(aq) + Ba(NO_3)_2(aq)$ Forms a coloured solution with no precipitate
- (vi). The CORRECT ORDER OF basic character of the conjugate base of the following alcohols is



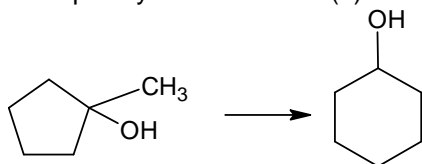
- (vii). An acidified solution of potassium chromate was layered with an equal volume of amyl alcohol. When it was shaken after the addition of 1 mL of 3% H_2O_2 , a blue alcohol layer was obtained. The blue color is due to the formation of a chromium compound 'X'. The oxidation state of chromium in a molecule of X is +6.

SECTION – C (Numerical Answer Type)

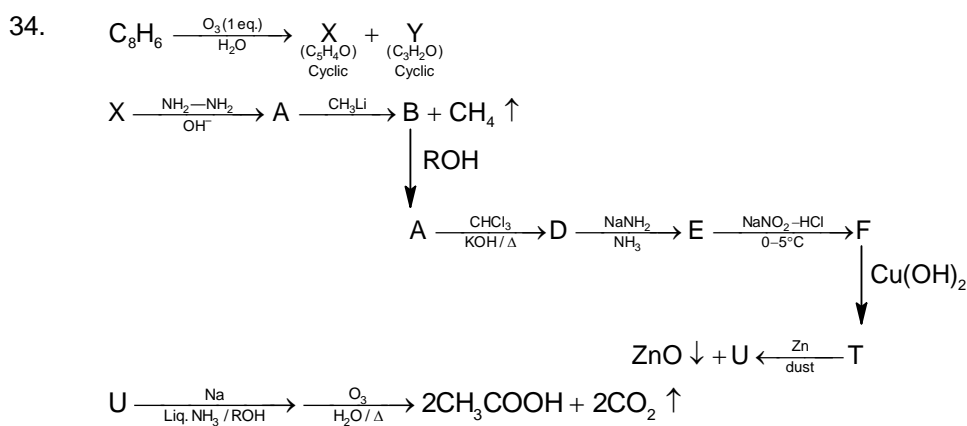
This section contains **06** questions. The answer to each question is a **NUMERICAL VALUE**. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. XXXXX.XX).

31. Calculate the mass of SeO_3^{-2} in a solution on the basis of following data:
20 ml of M/6 solution of $KBrO_3$ was added to definite volume of SeO_3^{-2} solution. The Bromine evolved was removed by boiling and excess of $KBrO_3$ was back titrated with 5.1 ml of N/25 solution of $NaAsO_2$. The reactions involved are given below (At mass of Se = 79)
- $$SeO_3^{-2} + BrO_3^- + H^+ \rightarrow SeO_4^{-2} + Br_2 + H_2O$$
- $$BrO_3^- + AsO_2^- + H_2O \rightarrow Br^- + AsO_4^{-3} + H^+$$

32. ΔG_f for the formation of n-butane is $-15.69 \text{ kJmol}^{-1}$ and for isobutane is $-21.39 \text{ kJmol}^{-1}$. Starting with 1 mole of n-butane, calculate the moles of isobutane in the mixture after heating (in the presence of catalyst, e.g. AlCl_3) until equilibrium is obtained. (Given that $2.303 RT = 5.7$ at 298 K)
33. Following conversion can be done in four steps using four reagents one after the other. These four reagents are listed below with some other reagents. Write the number of most suited reagent, in order you want to use them and present the four digit number in ANSWER sheet. For example if you want to use (1) than (2) than (3) than (4) fill 1234 in ANSWER sheet.

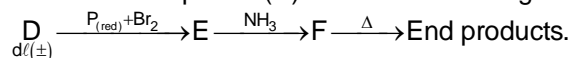


- | | |
|---|---------------------------------------|
| (1) $\text{O}_3 / \text{Zn} / \text{H}_2\text{O}$ | (2) $\text{O}_3 / \text{H}_2\text{O}$ |
| (3) conc. $\text{H}_2\text{SO}_4 / \Delta$ | (4) aq. KOH / Δ |
| (5) $\text{H}_2 / \text{Ni} / \Delta$ | (6) $\text{Zn-Hg} / \text{HCl}$ |
| (7) $\text{NH}_2\text{-NH}_2 / \text{EtOK}$ | (8) $\text{H}_3\text{O}^{\oplus}$ |
| (9) $\text{NaOH} / \text{CaO} / \Delta$ | |

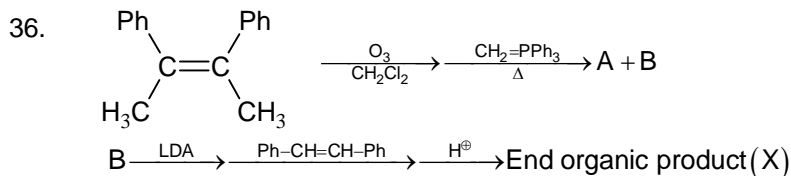


In the above reaction sequence molar mass of U is...

35. Two isomeric compounds A and B of molecular formula $\text{C}_5\text{H}_9\text{N}$ does not react with HNO_2 or acetyl chloride. On refluxing separately with dil. HCl (A) gives (C). Where as (B) gives (D) as a product. Both C and D are isomeric compounds which react with NaOH the volume in ml of 0.5 M NaOH that react with 0.102 g of (C) or D is y ml. If compound (B) is optical active. When racemic mixture of compound (D) is react in following reaction sequence.



The total number of optical active compounds are formed at the end of the reaction is (x) then the value of (x + y) is



compound (A) consists phosphorous atom. If Degree of unsaturation of compound X is n and Total number of stereoisomers for compound X is m. What is the value of "n+m" ?

Mathematics**PART – III****SECTION – A****(One or More than one correct type)**

This section contains **06** multiple choice questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

37. For $n = 1, 2, 3, \dots, n+1$ let $P_1, P_2, P_3, \dots, P_{n+1}$ be the points such that AP_nP_{n+1} be a right angle triangle with $\angle AP_nP_{n+1} = 90^\circ$ for $n = 1, 2, 3, \dots, n$. Given $AP_1 = 1$ and $P_nP_{n+1} = 2^{n-1}$ for all $n = 1, 2, 3, \dots, n$, then

- (A) $AP_{n+1} = \frac{1}{2}\sqrt{4^n + 2}$
 (B) $AP_{n+1} = \sqrt{\left(\frac{4^n + 2}{3}\right)}$
 (C) $\sin(\angle P_nAP_{n+1}) = \sqrt{\left(\frac{3 \cdot 4^n}{2^{2n+2} + 8}\right)}$
 (D) $\lim_{n \rightarrow \infty} \angle P_nAP_{n+1} = \frac{\pi}{3}$

38. Let C be the locus of a point, such that length of tangents drawn from it to the variable circle passing through the point A(4, 5) and B(7, 11) is independent of radius of the circle. If curve C touches the parabola $x^2 - 4x + 2y + k = 0$, then

- (A) $k = 6$
 (B) $k = 2$
 (C) curve C is $y = 2x - 3$
 (D) curve C is $2y = 3x - 2$

39. Let $f(x)$ is continuous $\forall x \in \mathbb{R}$ where $\lim_{x \rightarrow \infty} \sum_{k=1}^x f\left(\frac{10k}{x}\right) \cdot \frac{2}{x} = 30$ and $\lim_{x \rightarrow \infty} \sum_{k=1}^x f\left(2 - \frac{2k}{x}\right) \cdot \frac{1}{2x} = 12$,

then

- (A) $\int_0^2 f(t) dt = 48$
 (B) $\int_0^{10} f(t) dt = 150$
 (C) $\lim_{x \rightarrow \infty} \sum_{k=1}^x 6f\left(2 + \frac{8k}{x}\right) \cdot \frac{1}{x} = \frac{153}{2}$
 (D) $\int_2^{10} f(t) dt = 102$

40. Let $x_1 = \sum_{r=0}^{\infty} \left(\frac{\sin r \theta \cos^r \theta}{r!} \right)$ and $x_2 = \sum_{r=0}^{\infty} \frac{\cos r \theta \cos^r \theta}{r!}$, then
- (A) $x_1^2 + x_2^2 = e^{2 \cos^2 \theta}$
- (B) $x_1 + x_2 = e^{\cos^2 \theta} \sin \left(\frac{\pi}{4} + \sin \theta \cos \theta \right)$
- (C) $x_2^2 - x_1^2 = e^{2 \cos^2 \theta} \cos(2 \sin \theta \cos \theta)$
- (D) $x_1 x_2 = \frac{e^{2 \cos^2 \theta}}{2} \sin(2 \sin \theta \cos \theta)$
41. Let $P(x) = x^2 + ax + b$, where $a, b \in I$. If $P(x)$ is a common factor of both $x^4 - 3x^2 + 9$ and $2x^4 - 6x^3 + 9x^2 - 9x + 9$, then
- (A) $P(3) = P(0)$
- (B) $|P(0) - P(1)| = 2$
- (C) $\frac{P(0)}{P(3)} < 1$
- (D) $|P(0) - P(3)| > 1$
42. Consider the circle $x^2 + y^2 - 8x - 18y + 88 = 0$ with centre C and the point P(2, 5) outside it. From the point P, a pair of tangents PQ and PR are drawn to the circle with S as midpoint of QR. The line joining P to C intersect the given circle at A and B. Then which of the following is/are true?
- (A) The angle between two tangents from point P is $\tan^{-1} 3\sqrt{11}$
- (B) Area of ΔPQR is $\frac{3 \times (11)^{3/2}}{20}$ square unit
- (C) Equation of the circum circle ΔPQR is $x^2 + y^2 - 6x - 14y + 53 = 0$
- (D) Length of tangent drawn from point P to the given circle is $\sqrt{11}$ unit

SECTION – B
(Single Digit Integer Type)

This section contains **06** questions. The answer to each question is a **Single Digit integer** ranging from **0 to 9**, both inclusive.

43. Let $\alpha = e^{i \left(\frac{2\pi}{2021} \right)}$, then the value of $(2^{2021} - 1) \sum_{r=1}^{2020} \left(\frac{1}{2 - \alpha^r} \right) = a \cdot 2^b + 1$; where $a, b \in N$, then $|a - b|$ is
44. Let $\{x_n\}$ is a sequence $\forall n \in N$, such that $5x_{n+1} = 3x_n + 4$, and $x_1 = -7$, then $\lim_{n \rightarrow \infty} (x_n)$ is equal to
45. In a ΔABC with angles A, B, C and corresponding sides a, b and c satisfying equation $a \cos B - b \cos A = \frac{3}{5}c$, then the value of $\frac{\tan A}{\tan B}$ is
46. The number of functions $f : \{1, 2, 3, \dots, n\} \rightarrow \{2020, 2021\}$ which satisfy the condition that $f(1) + f(2) + f(3) \dots f(2020)$ is an odd integer is 2^k , then “n – k” is

47. The value of k if $\begin{vmatrix} (x^2 + 1)^2 & (xy + 1)^2 & (xz + 1)^2 \\ (xy + 1)^2 & (y^2 + 1)^2 & (yz + 1)^2 \\ (xz + 1)^2 & (yz + 1)^2 & (z^2 + 1)^2 \end{vmatrix} = k(y - z)^2(z - x)^2(x - y)^2$ is equal to
48. Let $N = 2^{n-1}(2^n - 1)$ where $(2^n - 1)$ is a prime number and $n \geq 2$ is a natural number, let $x_1, x_2, x_3, \dots, x_k$ be all possible divisors of N , then $\frac{1}{N} \left(\sum_{r=1}^k x_r \right)$ is

SECTION – C
(Numerical Answer Type)

This section contains **06** 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).

49. Let $a_0, a_1, a_2, \dots, a_n, \dots$ be a sequence of numbers satisfying. $(6 - a_{n+1}) \cdot (12 + a_n) = 72$ and $a_0 = 3$. Then the value of $\sum_{i=0}^5 \frac{1}{a_i}$ is equal to
50. The minimum of $y = (a \cos^2 x - 3) \sin x$ is -3 , then the range of real number a is $[\alpha, \beta]$, the $\alpha + \beta$ is
51. Let x, y, z be complex number such that $x + y + z = 2$, $x^2 + y^2 + z^2 = 3$ and $xyz = 4$, then $\left| \frac{1}{xy - z - 1} + \frac{1}{yz + x - 1} + \frac{1}{zx + y - 1} \right|$ is
52. The value of $\int_0^{\pi/2} \frac{x \cos x - \sin x}{x^2 + \sin^2 x} dx$ is equal to $\tan^{-1}(a) - b$, ($a, b \in \mathbb{R}$), then ab is
53. The maximum value of expression $2^{\frac{1}{2}} \cdot 4^{\frac{1}{4}} \cdot \dots \cdot (2^n)^{\frac{1}{2^n}}$ (where n is positive integer) is equal to
54. The value of the series $\sum_{n=1}^{\infty} \tan^{-1} \left(\frac{8n}{n^4 - 2n^2 + 5} \right)$ is $\cot^{-1}(k)$, then $|k|$ is equal to