FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
OPEN TEST – II
PAPER –2
TEST DATE: 13-04-2025

ANSWERS, HINTS & SOLUTIONS

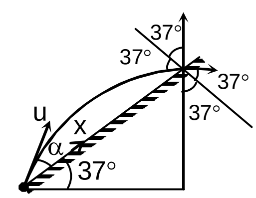
Physics

PART – I

Section – A

1. A

Sol. At t = T



$Y = 0 \Rightarrow T = \dfrac{2u\sin\alpha}{g\cos 37^\circ}$

$\Rightarrow T = \dfrac{u\sin\alpha}{4}$

Also at t = T, v is at 37° with normal on the plane i.e.

$\tan 37^\circ = \dfrac{V_x}{-V_y}$

$\dfrac{3}{4} = \dfrac{u\cos\alpha - \frac{3}{5}gT}{-\left(u\sin\alpha - \frac{4}{5}gT\right)}$

By solving $\tan\alpha = \dfrac{4}{9}$

Also, $T = \dfrac{1}{4}\sqrt{388}\sin\alpha = \sqrt{\dfrac{388}{4}} \times \dfrac{4}{\sqrt{97}} = 2\,\text{sec}$

Velocity of particle just before it collides

$v_y = u_y + a_y T = -8$

$v_x = u_x + a_x T = 6$

$\therefore\ v = \sqrt{8^2 + 6^2} = 10$ m/s

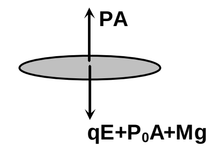
Velocity after collision = 10 m/s

$\therefore\ T' = \dfrac{2 \times 10}{g} = 2\,\text{sec}$

Total times in returning is 2 + 2 + 2 = 6 sec

2. A

Sol. $PA = qE + P_0A + Mg$



$PV_0^\gamma = \text{constant}$

After displacing piston through small distance x in downward directions pressure changes. Let new pressure be P′

So, $PV_0^\gamma = P'(V_0 - AX)^\gamma$

$$PV_0^\gamma = P'V_0^\gamma\left(1 - \frac{\gamma AX}{V_0}\right)$$

$$\Rightarrow P = P'\left(1 - \frac{\gamma AX}{V_0}\right)$$

$$Mg + \frac{qE}{A} + P_0 = P'\left(1 - \frac{\gamma AX}{V_0}\right)$$

$$\omega = \sqrt{\frac{\left(\frac{qE + Mg}{A} + P_0\right)\gamma A^2}{MV_0}}$$

3. A

Sol. $\frac{dm}{dx} = kx$

$$\Rightarrow \int_0^m dm = k\int_0^\ell x dx \Rightarrow k = \frac{2m}{\ell^2}$$

$$dI = x^2 dm = x^2 \frac{2m}{\ell^2} x dx$$

$$I = \frac{2m}{\ell^2}\int_0^\ell x^3 dx = \frac{m\ell^2}{2}$$

$$X_{cm} = \int x dm = \frac{2\ell}{3}$$

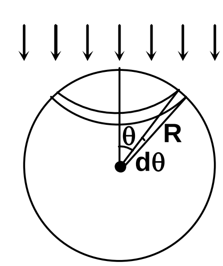
$$-(mg\sin 30°)\ \frac{2\ell}{3}\theta = \frac{m\ell^2}{2}\alpha$$

$$\Rightarrow \alpha = -\frac{2g}{3\ell}\theta$$

$$T = 2\pi\sqrt{\frac{3\ell}{2g}}$$

4. C

Sol. $E.2\pi r = \pi r^2 \frac{dB}{dt}$



$$\Rightarrow E = \frac{r}{2}\frac{dB}{dt}$$

$$rdq \cdot E = \frac{r^2}{2} dq \frac{dB}{dt}$$

$$d\tau = \frac{dB}{dt}\frac{r^2}{2} dq$$

$$\int d\tau = -\frac{dB}{dt}\int_0^{\pi^2}\frac{1}{2}R^2\sin^2\theta\cdot 2\pi R\sin\theta R d\theta\sigma \qquad (\because r = R\sin\theta)$$

$$\tau = \frac{dB}{dt}\frac{4}{3}\sigma\pi R^4$$

$$\int \tau dt = \frac{4\sigma\pi R^4}{3}\int_B^0 dB$$

$$I\omega - 0 = \frac{4}{3}B\sigma\pi R^4$$

Conservation of angular momentum

$$I\omega = I\frac{v}{R} + mvR$$

$$\Rightarrow v = \frac{I\omega R}{I + mR^2} = \frac{5QBR}{21m}$$

5. A, D

Sol. $F - T - \mu mg\cos\theta - mg\sin\theta = ma_1$

$\Rightarrow 106 - T - 40 = 4a_1$ …(i)

$10g\sin\theta - T - f_S = 10a_C$

$\Rightarrow 60 - T - f_S = 10a_C$ …(ii)

$f_S R + rT = I\alpha$

$\Rightarrow 2f_S + T = 10\alpha$ …(iii)

$r\alpha - a_C = a_1$ …(iv)

and $a_C = R\alpha$ …(v)

Solving the equations $a_C = 2\ m/s^2$, $a_1 = -1\ m/s^2$

6. A, C, D

Sol. $\varepsilon - i_1 r + \varepsilon - i_1 r + \varepsilon - i_1 r + \varepsilon - i_1 r + \varepsilon - i_1 r = 0$

$$\Rightarrow i_1 = \frac{\varepsilon}{r} = 5A$$

$$\varepsilon - i_2 r - i_2 R - i_2 R = 0 \Rightarrow i_2 = \frac{\varepsilon}{r + 2R} = 1A$$

$I = I_1 + I_2 = 6A$

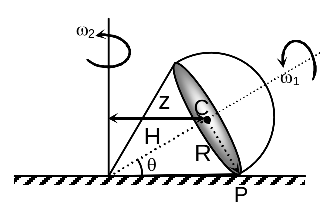
Charges on capacitors 2C, C is zero since current in resistance R is zero

$$\therefore \varepsilon - i_2 R = \frac{q}{4C}$$

$q = 16\mu c$

7. B, D

Sol. Velocity of point P is $\omega_2 \times 2R - \omega_1 R = 0$



$$\frac{T_1}{T_2} = \frac{\omega_2}{\omega_1} = \frac{1}{2}$$

$$f_S = \frac{mv_0^2}{z} = \frac{2}{3}\frac{mv_0^2}{R}$$

8. A, B, C

Sol. Velocity of particle after collision in vertical direction is 10 m/s

$\mu N\Delta t = \mu \times 20\ m$

For disc, $\mu N\Delta t = mv_C$

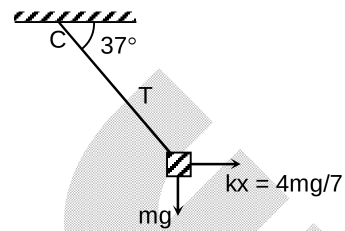
$\therefore v_C = 4$ m/s

$\mu N \Delta t \dfrac{R}{2} = \dfrac{MR^2}{2}(\omega - 0)$

$\Rightarrow \omega = 20$ rad/s

9. B, C

Sol. Initial tension in spring $kx = \dfrac{4mg}{7}$



FBD of block just after string is cut
Since, v = 0
$\therefore$ acceleration along string is zero

$T = k\cos37° + mg\sin37° = \dfrac{37}{7}N$

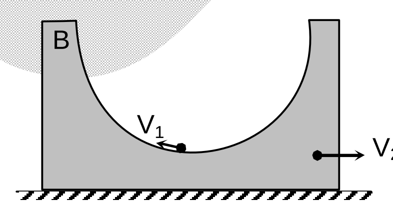
Acceleration is only perpendicular to spring

ma = mg cos 37° – kx sin 37°

$\Rightarrow a = \dfrac{32}{7}$ m/s^2

10. A, C

Sol. Using conservation of energy and momentum when particle leaves end B, velocity of the block will be zero.



At lower most point vertical acceleration is $\dfrac{v^2}{R}$

$\therefore 5v_1 = 10v_2$

and $5 \times g \times 6 = \dfrac{1}{2} \times 5v_1^2 + \dfrac{1}{2} \times 10 \times v_2^2$

Solving equations $v_1 = \sqrt{80}$, $v_2 = \sqrt{20}$

$v_{P,B} = \sqrt{80} + \sqrt{20}$

$a_{P,B} = \dfrac{v_{P,B}^2}{R} = \dfrac{(\sqrt{80}+\sqrt{20})^2}{2}$

$\vec{a}_{P,g} = \vec{a}_{P,B} + \vec{a}_{B,g}$

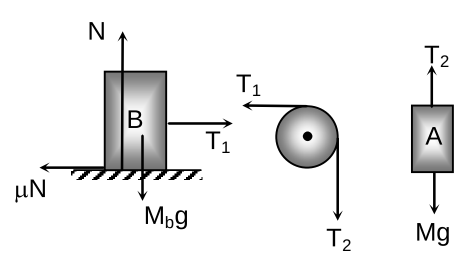
$\vec{a}_{B,g} = 0$ (when particle is at lowest position)

$\therefore \vec{a}_{P,g} = \vec{a}_{P,B} = 90$ m/s^2

Section – B

11. 2

Sol. $T_1 = \mu M_B g$



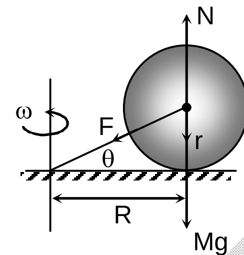
$T_2 = mg$
due to friction on pull
in limiting case ,when block B is about to slide

$T_2 = T_1 e^{\mu\frac{\pi}{2}}$

Solving equation m = 2kg

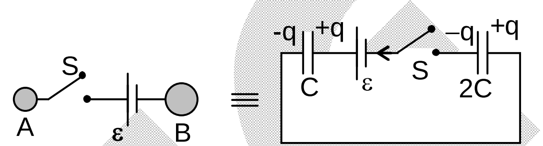
12. 4

Sol. $F\cos\theta = m\omega^2 R$
$F\sin\theta + mg = N$
$\therefore N = mg + m\omega^2 r = 36$ N



13. 3

Sol. $\frac{q}{C} - \varepsilon + \frac{q}{2C} = 0$



$q = \frac{2}{3}C\varepsilon$

Loss energy $H = q\varepsilon - \Delta U$

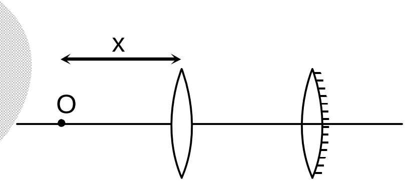
$= \frac{3}{4}\frac{q^2}{C}$, where $C = 4\pi\varepsilon_0 \times 9 = 30\ \mu J$

14. 4

Sol. Standing wave $y = 2A\sin kx \cos\omega t$
Has energy $E = \mu\omega^2 A^2 \ell$

15. 6

Sol. $\frac{1}{v} - \frac{1}{-x} = \frac{1}{24}$



$\Rightarrow \frac{1}{v} = \frac{1}{24} - \frac{1}{x}$

$\frac{1}{v} = -\frac{1}{\left(\frac{24-x}{24x}\right)}$

Object distance for silvered lens is $(14-x) + \frac{24x}{(24-x)}$ for image to be on object O, this distance must be equal to equivalent radius of mirror.
For (Reflecting lens is effectively mirror)

$-\frac{2}{R_{eq}} = 2\left(\frac{3}{2}-1\right)\left(\frac{1}{32} - \frac{1}{-32}\right) - \frac{3}{-32}$

$\Rightarrow R_{eq} = -16$ cm

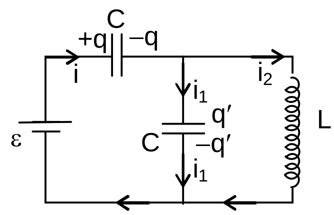
$\therefore 16 = (14-x) + \frac{24x}{(24-x)}$

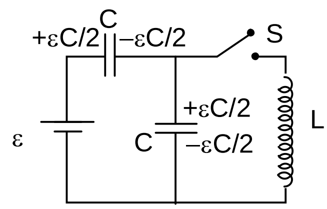
$\Rightarrow x = 6$ cm

16. 7

Sol. Using Kirchhoff's Law

$\varepsilon - \frac{q}{C} - \frac{q'}{C} = 0$ …(i)





$$-\frac{q}{C}+L\frac{di_2}{dt}=0 \quad \ldots(ii)$$

$$\varepsilon-\frac{q}{C}-L\frac{di_2}{dt}=0 \quad \ldots(iii)$$

Solving these equations and at t = 0, i_2 = 0 and $i_2=\varepsilon\sqrt{\frac{C}{2L}}\sin\omega t$

$\therefore\ i_{2(max)}=\varepsilon\sqrt{\frac{C}{2L}}=7A$

17. 5

Sol. Consider some resistance to the voltmeter and applying Kirchhoff's law

18. 4

Sol. $K_{e\,max}=h\nu-\phi=\frac{6.6\times10^{-34}\times7.27\times10^{14}}{1.6\times10^{-19}}-1=2\text{ eV}$

Maximum potential difference is 2V

$U=\frac{1}{2}CV^2$

Chemistry PART – II

Section – A

19. A

Sol. AB_2L_3 has linear shape but AB_3L_2 has T-shape.

20. B

Sol. Total moles of air $= \frac{PV}{RT} = \frac{2 \times 49.26}{0.0821 \times 300} = 4$ mole

$\therefore n_{O_2} = 4 \times 0.2 = 0.8$ mole

Moles of 'C' = 1

$$\underset{1\text{ mole}}{C} + \underset{0.8\text{ mole}}{O_2} \longrightarrow \underset{x\text{ mole}}{CO} + \underset{y\text{ mole}}{CO_2}$$

Apply POAC for C-atom

$1 \times 1 = x \times 1 + y \times 1$ or $x + y = 1$ … (1)

Also, apply POAC for O-atoms,

$0.8 \times 2 = x \times 1 + y \times 2$ or $x + 2y = 1.6$ … (2)

On solving Equation (1) and (2), we get

$y = 0.6$ and $x = 0.4$

So, total amount of heat produced

$= -0.4 \times (26) - 0.6 \times (94)$

$= -10.4 - 56.4$

$= -66.8$ kcal

21. A

Sol. Since, decomposition of N_2O on hot platinum surface follows ZERO order kinetics:

So, $t_{1/2} = \frac{a}{2k_o}$

or $a = (2k_o) \times t_{1/2}$

$\log a = \log(2k_o) + \log t_{1/2}$

$y = C + mx$

$m = 1$ or $\tan\theta = 1$ or $\theta = 45^o$

$C = \log 2k_o = +ve$

22. D

Sol. $\alpha = \frac{\theta}{\ell(dm) \times C(g/ml)}$

$-92.4^o = \frac{-27.7^o}{(1\text{ dm}) \times C}$

$C = \frac{27.7}{1 \times 92.4} = 0.2997$ g / ml

So, mass of fructose dissolved in 100 mL solution

$= 0.2997 \times 100$

= 29.97 g.

23. A, C, D

Sol. Since, the crystal should be electrically neutral. So, empirical formula of the solid should be:

$$\left(Al^{3+}\right)_{4\times\frac{1}{2}}\left(Zn^{2+}\right)_{8\times\frac{1}{8}}\left(S^{2-}\right)_{4} \Rightarrow ZnAl_2S_4$$

Since, Zn^{2+} ions are present in tetrahedral void, so, its coordination number = 4.

Also, Al^{3+} ions are present in octahedral void, so, its coordination number = 6.

24. A, C

Sol. Since, the solution contains a weak base (NH_4OH) and salt of this weak base with strong acid, i.e. $(NH_4)_2SO_4$. So, it is a basic buffer.

By Henderson's Equation:

$$pOH = pK_b + \log\frac{2\times 0.01}{0.02} = pK_b$$

$$\therefore pH = 14 - pOH$$

$$pH = 14 - (5 - \log 2) = 9 + \log 2$$

Since, it's a buffer, so dilution does not affect the pH.

25. A, B, C

Sol.
(A) $XeF_6 + RbF \longrightarrow Rb^+ + XeF_7^-$

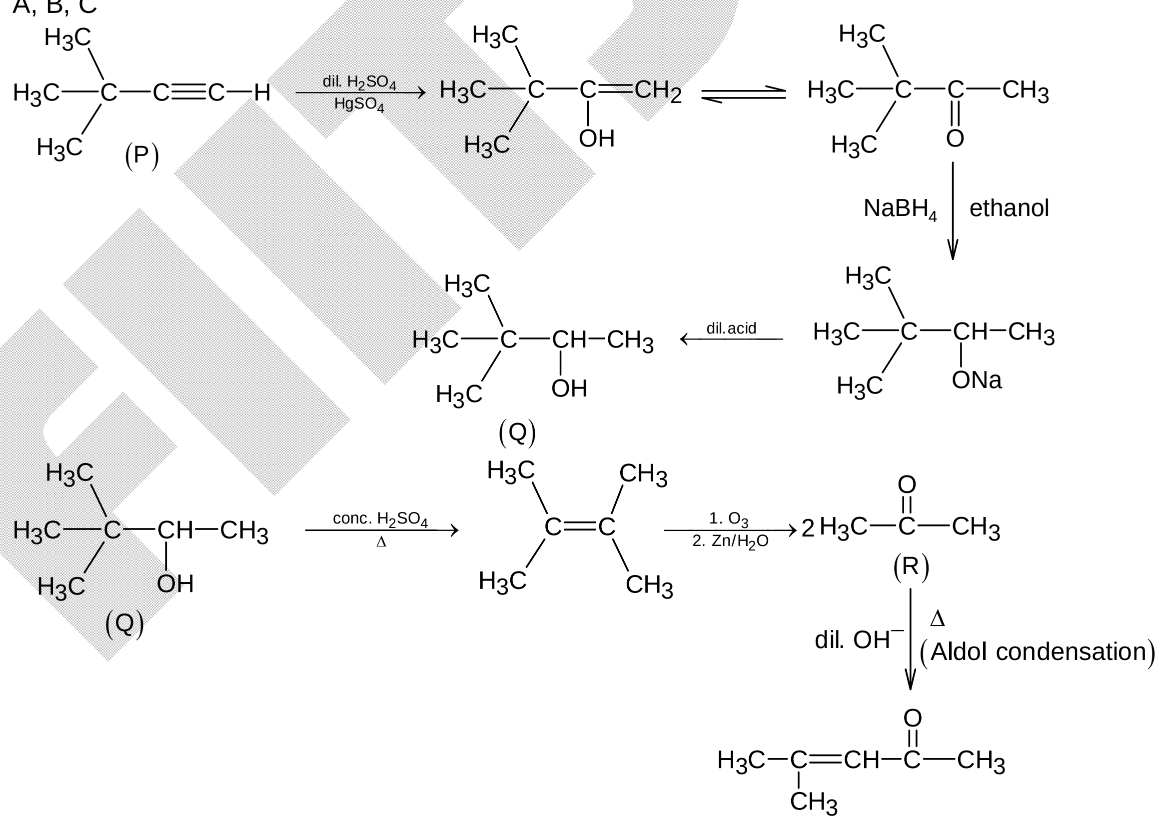
(B) $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$

(C) $2XeF_6 + SiO_2 \longrightarrow 2XeOF_4 + SiF_4$

(D) $XeF_6 + 6HCl \longrightarrow 6HF + Xe + 3Cl_2$

26. A, B, C

Sol.



27. A, B, C, D

Sol. $r = \dfrac{2[A]}{3+[A]}$

So, integrated rate equation of the above reaction is

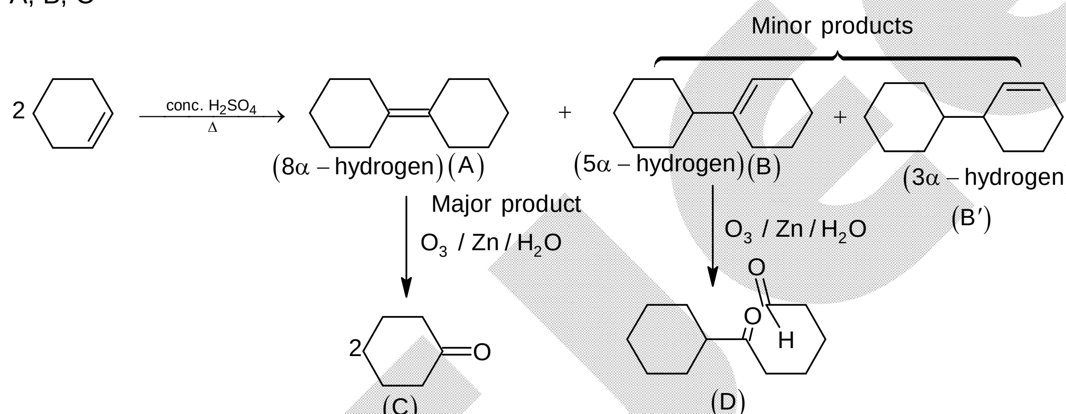
$$t = \frac{1}{2}\left[[A]_o - [A] + 3\ell n\frac{[A]_o}{[A]}\right]$$

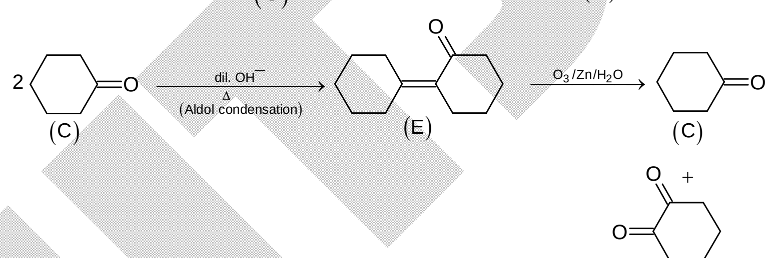
So, $t_{1/2} = \dfrac{1}{4}[A]_o + \dfrac{3}{2}\ell n2$

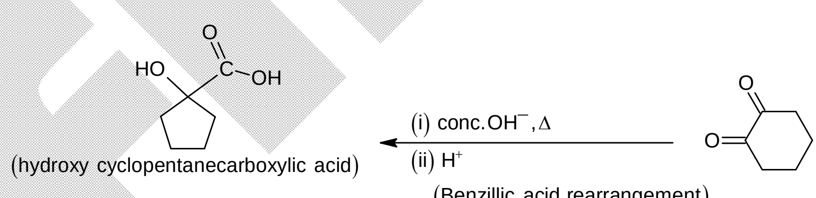
$$t_{3/4} = \frac{3[A]_o}{8} + 3\ell n2 = \frac{3}{8}\times 8 + 3\times 0.7 = 5.1 \text{ minutes}$$

28. A, B, C

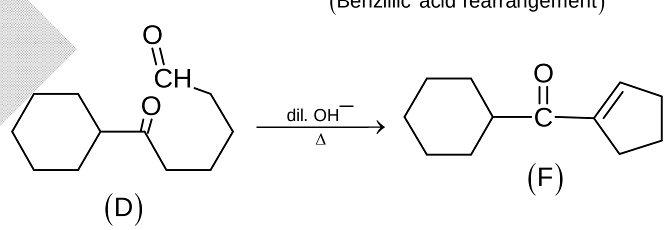
Sol.







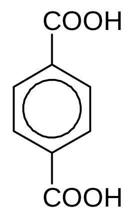
Also,



Section – B

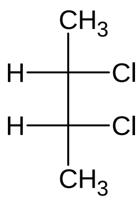
29. 8

Sol.



has 3 planes of symmetry, i.e. x = 3

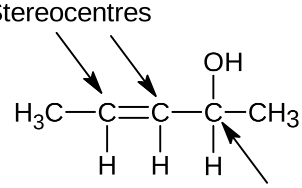
(Terephthalic acid)



It has one plane of symmetry and one centre of symmetry. So, y = 2.

(Meso-2,3-dichlorobutane)

Stereocentres



(Pent-3-en-2-ol) Stereocentres

So, z = 3.

30. 8

Sol. x= 2, y = 2, z = 4.
n = 1, m = 2

31. 6

Sol. Freezing point in Kelvin $= (-1.8\ \text{m} + 273)$ K

Boiling point in Kelvin $= (373 + 0.5\ \text{m})$ K

Difference of boiling point and freezing point = 100 + 2.3 m = 100.46

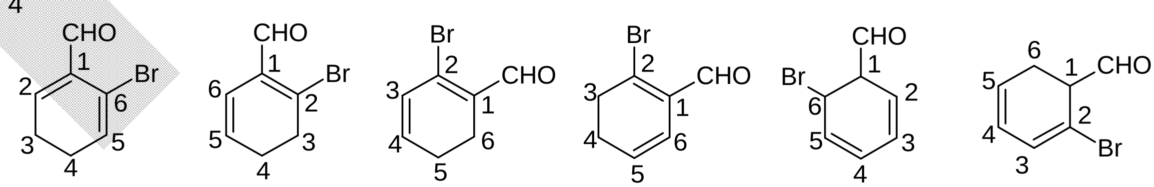
$\therefore M = 0.2$

Now, $0.2 = \dfrac{P \times 1000}{60 \times 500}$

$\therefore P = 6$ gram

32. 4

Sol.



I II III IV V VI

33. 4

Sol. (i) $Na-Hg+H_2O \longrightarrow NaOH+Hg+\frac{1}{2}H_2$

(ii) $Na_2CO_3 \xrightarrow{\Delta} X$

(iii) $4NaOH+ZnCl_2 \longrightarrow Na_2ZnO_2+2NaCl+2H_2O$

(iv) $CuSO_4+Na_2CO_3+H_2O \longrightarrow \underbrace{CuCO_3.Cu(OH)_2}_{\text{basic copper carbonate}}$

(v) In case of alkali metals, for performing flame test, chlorides are preferred over carbonates as chlorides are more volatile.

34. 5

Sol. $N_{H_2O_2} = \frac{22.4}{5.6} = 4$

Let, mass of pure H_2S present in impure sample = 'w' gm

Then $4\times5\times10^{-3} = \frac{w}{\left(\frac{34}{2}\right)} \Rightarrow w = 0.34$ gm

So, % of pure H_2S in impure sample $= \frac{0.34}{0.40}\times100 = 85\%$

$\therefore 17x = 85$

$\therefore x = 5$

35. 1

Sol. (i) $NH_4Cl+Na_2B_4O_7 \xrightarrow{\text{red hot}} (BN)_x+NaCl+H_2O$

(ii) $BCl_3+NH_4Cl \xrightarrow{140^0C} B_3N_3H_3Cl_3 \xrightarrow{NaBH_4} B_3N_3H_6$

(iii) $KBF_4+K \xrightarrow{\Delta} B+KF$

(iv) $B_2O_3+Cr_2(SO_4)_3 \xrightarrow{\Delta} Cr(BO_2)_3$

(v) $B_2H_6 \xrightarrow[\Delta]{CH_3NH_2} [BH_2(CH_3NH_2)_2]^+[BH_4]^-$

(vi) $B_2H_6 \xrightarrow[\Delta]{(CH_3)_3N} 2BH_3.(CH_3)_3N$

36. 8

Sol. Average velocity $= \sqrt{\frac{8RT}{\pi M}} = 4\times10^2$

$\therefore RT = 2\pi M\times10^4$

Total kinetic energy of 'He' $= \frac{3}{2}nRT = \frac{3}{2}\times\frac{6}{4}\times RT = \frac{9RT}{4}$

Total kinetic energy of 'He' $= \frac{9}{4}\times2\pi M\times10^4$

$= \frac{9}{4}\times2\pi\times(4\times10^{-3})\times10^4$

$= 180\pi$ Joule

Total kinetic energy of 'Ne^{20}' $= \frac{3}{2}nRT = \frac{3}{2}\times\frac{12}{20}\times RT$

$= \frac{9}{10} \times 2\pi M \times 10^4$

$= \frac{9}{10} \times 2\pi \times \left(20 \times 10^{-3}\right) \times 10^4$

$= 360\pi$ Joule

Average kinetic energy of mixture per mole $= \frac{360\pi + 180\pi}{1.5 + 0.6}$

$= \frac{540}{2.1} \times 3.14$

$= 807.42$ J

$= 0.80742$ kJ

So, x = 0.8

$\therefore 10x = 8$.

Mathematics

PART – III

Section – A

37. D

Sol. Favorable cases: For first diagonal we have 12 choices them for the second to be skew we have 5 choices. So number of favorable choices is $\frac{12\times 5}{2}=30$

Required probability = $\frac{30}{{}^{12}C_2}=\frac{5}{11}$

38. C

Sol. Since $\left[\sqrt{2066}\right]=\left[\sqrt{2067}\right]=\left[\sqrt{2068}\right]=\left[\sqrt{2069}\right]=45$ and 2023 + 45 = 2068

39. C

Sol. Let $z=-x-\frac{\pi}{6}$, then $z\in\left[\frac{\pi}{6},\frac{\pi}{4}\right]$ and $2z\in\left(\frac{\pi}{3},\frac{\pi}{2}\right)$

Then, $y=\cot z+\tan z+\cos z=\frac{2}{\sin 2z}+\cos z$

Since, both $\frac{2}{\sin 2z}$ and cos z are monotonic decreasing in this case

Then $y_{max}=\frac{2}{\sin\frac{\pi}{3}}+\cos\frac{\pi}{6}=\frac{11\sqrt{3}}{6}$

40. A

Sol. $x^a=y^b=z^c=\lambda$, now x, y, z are in Geometric Progression

$\Rightarrow \frac{2}{b}=\frac{1}{a}+\frac{1}{c}$ therefore a, b, c are in Harmonic Progression

By G.M. > H.M.; $\sqrt{ac}>b$ for a^3, b^3, c^3

A.M. > G.M.; $\frac{a^3+c^3}{2}>\left(\sqrt{ac}\right)^3>b^3$

41. A, D

Sol. Draw variable lines of slope 4x – 3y that passes through the points on or inside the triangle

42. A, C

Sol. $\left|\frac{1}{z}+z_0\right|=\frac{1}{|z|}$ multiply both side by $\left|\frac{z}{z_0}\right|$, we have $\left|z-\left(-\frac{1}{z_0}\right)\right|=\frac{1}{|z_0|}$

Circle with centre $\frac{-1}{z_0}$ and radius $\frac{1}{|z_0|}$, however we have to exclude the point z = 0 from the locus

43. B, D

Sol. If PA + PB is minimum $\Rightarrow$ Area of ΔPAB is minimum
$\Rightarrow$ C is mid-point of AB $\Rightarrow$ Equation of AB is x + y = 10

44. A, B, C

Sol. Since, $\log_2 x - 1 \ge 0$; Let $\sqrt{\log_2 x - 1} = t$, we have $t - \frac{3}{2}t^2 + \frac{1}{2} > 0$ and $t \ge 0$

Solution of the above inequality is $0 \le t < 1 \Rightarrow 0 \le \log_2 x - 1 < 1 \Rightarrow 2 \le x < 4$

45. A, B, D

Sol. $f(x) = \frac{x^2}{2} + 3$ if x is even and $f(x) = \frac{x+1}{2}$ is x is odd

46. B, C

Sol. If $\lambda \ge 6$, then sum of solutions = 5π and if $\lambda \le -6$, then sum of solutions = 3π

Section – B

47. 1

Sol. $\left(x + \frac{1}{x^{2023}}\right)(1 + x^2 + x^4 + ... + x^{2022}) = 2024$

$\Rightarrow (x + x^3 + x^5 + ... + x^{2023}) + \left(\frac{1}{x^{2023}} + \frac{1}{x^{2021}} + ... + \frac{1}{x}\right) = 2024$

$\Rightarrow$ By A.M., G.M. inequality, we get

$(x + x^3 + x^5 + ... + x^{2023}) + \left(\frac{1}{x} + \frac{1}{x^3} + ... + \frac{1}{x^{2023}}\right) \ge 2 \times 1012 = 2024$

Where the equality holds if and only if $x = \frac{1}{x}$, $x^3 = \frac{1}{x^3}$, ..., $x^{2023} = \frac{1}{x^{2023}}$ $\Rightarrow x = 1$

48. 7

Sol. $|z_1| = |z_2| = 3$ and $z_1\bar{z}_2 + \bar{z}_1 z_2 = -9 \Rightarrow |z_1\bar{z}_2| = 9$

Let $z_1\bar{z}_2 = 9(\cos\theta + i\sin\theta)$, then $\bar{z}_1 z_2 = 9(\cos\theta - i\sin\theta)$

$\Rightarrow 18\cos\theta = -9 \Rightarrow \cos\theta = -\frac{1}{2}$

$z_1\bar{z}_2 = -9\omega$ and $\bar{z}_1 z_2 = -9\omega^2$ where ω is cube root of unity other than 1

$\log_3\left|(z_1\bar{z}_2)^{2023} + (\bar{z}_1 z_2)^{2023}\right| = 2 \times 2023 = 4046$

49. 3

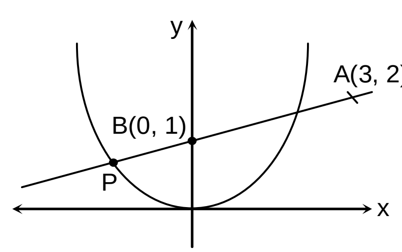
Sol. $f(x) = \sqrt{(x-3)^2 + (x^2-2)^2} - \sqrt{x^2 + (x^2-1)^2}$

Let P be any point on the parabola $y = x^2$ and A(3, 2), B(0, 1)

By Δ inequality $|PA - PB| \le AB$

$|PA - PB| \le \sqrt{10}$

$\therefore k = \sqrt{10}$



50. 6

Sol. Locus of I is the tangent at the vertex $\Rightarrow$ Locus is $x = \pm 3$

51. 8

Sol. $|\vec{a} - \vec{b}|^2 + |\vec{b} - \vec{c}|^2 + |\vec{c} - \vec{a}|^2 = 62 \Rightarrow \vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a} = -10 \Rightarrow \vec{c} = -4\vec{a} = -2\vec{b}$

52. 3

Sol. $\ln(1-t^2) = \sum_{r=1}^{\infty}\left(-\frac{t^{2r}}{r}\right) \Rightarrow \int_0^1 f(x)dx = \sum_{r=1}^{\infty}\frac{-1}{2r(r+1)} = -\frac{1}{2}$

53. 4

Sol. Let y = mx + c be the tangent $\Rightarrow x^4 - 2x^2 - x - (mx + c) = (x^2 + ax + b)^2$

$\Rightarrow$ a = 0, b = –1, m = –1, c = –1

$\Rightarrow$ x + y + 1 = 0 is tangent to the curve at (–1, 0) and (1, –2)

$\Rightarrow |\alpha_1| + |\alpha_2| + |\beta_1| + |\beta_2| = 4$

54. 3

Sol. A and B are (1, 2 3) and (2, 1, 2) respectively

If AC = d_1 and BC = d_2, then volume of tetrahedron = $\frac{1}{6}\cdot AB d_1 d_2 = \frac{\sqrt{3}}{6}d_1 d_2$

Also, $CD^2 = d_1^2 + d_2^2 + 3 \Rightarrow d_1^2 + d_2^2 = 24$

Using AM, GM, $\frac{d_1^2 + d_2^2}{2} \ge d_1 d_2 \Rightarrow d_1 d_2 \le 12 \Rightarrow V = 2\sqrt{3}$