FIITJEE

ALL INDIA TEST SERIES

CONCEPT RECAPITULATION TEST – IV

JEE (Main)-2025

TEST DATE: 21-03-2025

ANSWERS, HINTS & SOLUTIONS

Physics PART – A

SECTION – A

1. C

Sol. For the sector, $y_{cm} = \frac{4R}{3}\frac{\sin(\phi/2)}{\phi} = \frac{2R}{\pi}$ $\left(\because \phi = \frac{\pi}{3}\right)$

For the arc, $y_{cm} = \frac{2R\sin(\phi/2)}{\phi} = \frac{3R}{\pi}$

2. A

Sol. If acceleration of block 2 is a_2 to the right, then

$5a_2 = a_r + a = 6 + 4$

$\boxed{a_2 = 2m/s^2}$

3. C

Sol. $\alpha = \frac{\tau}{I} = \frac{FL}{\frac{mL^2}{3}} = \frac{3F}{m\ell}$ $\Rightarrow$ $a_{cm} = \frac{\ell}{2}\alpha = \frac{3F}{2m}$

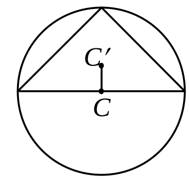
$\Sigma F_x = ma_{cm}$

$N_x + F = \frac{3F}{2}$ $\Rightarrow N_x = \frac{F}{2}$

$N_y = Mg$

4. C

Sol. C.M. of triangle is at $\frac{a}{3}$ from centre of circular plate



$$m_{\text{triangle}} = \frac{m_{\text{circle}}}{\pi}$$

$$y_{CM} = \frac{M_y - m_y}{M - m}$$

On solving, $\frac{a}{3(\pi - 1)}$

5. C

Sol. $-\Delta U = \Delta k_e$

$$-[U_B - U_A] = \frac{1}{2}mv^2$$

Ball will leave when normal at B = 0

$$\therefore\ mg\sin\beta - N_B = \frac{mv_B^2}{R} \Rightarrow 0 \quad \text{at} \quad B \quad \Rightarrow\ mg\sin\beta = \frac{mv_B^2}{R}$$

6. D

Sol. Block number 1 and 2*n* will suffer one collision each, block number 2 and 2*n* – 1 will suffer two collision each similarly block number *n* and *n* + 1 will suffer *n* collision each. So total number of collisions will be 2(1 + 2 + … + *n*) = *n* (*n* + 1)

7. A

Sol. $r = R\left(\frac{\ell_1}{\ell_2} - 1\right) = 132.4\left(\frac{70}{60} - 1\right) \approx 22.1\,\Omega$

8. B

Sol. 100 Ω, 25 Ω and 20 Ω are in parallel.

Their, net resistance is 10 Ω

$\therefore$ R_{net} = 4 Ω + 10Ω + 6Ω = 20 Ω

V = i R_{net} = 80 V

9. A

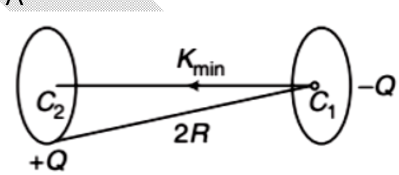
Sol. Current decreases $\frac{20}{30}$ times or $\frac{2}{3}$ times. Therefore, net resistance should become $\frac{2}{3}$ times.

$$\therefore\ R + 50 = \frac{3}{2}(2950 + 50)$$

Solving we get, R = 4450 Ω

10. A

Sol.



$$k_{C_1} + U_{C_1} = k_{C_2} + U_{C_2}$$

$$k_{min} + qV_{C_1} = 0 + qV_{C_2} \qquad \text{...(i)}$$

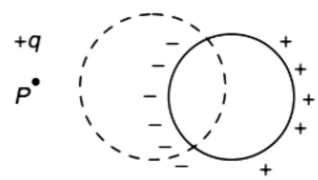
$$V_{C_1} = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q}{2R} - \frac{Q}{R}\right)$$

$$V_{C_2} = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q}{2} - \frac{Q}{2R}\right)$$

Substituting these values in Eq. (i), we can find K_{min}.

11. C

Sol.



The induced charges on conducting sphere due to +q charge at P are as shown in figure.
Now, net charge inside the closed dotted surface is negative. Hence, according to Gauss's theorem net flux is negative.

12. A

Sol. p^2V = constant

$$\therefore \left(\frac{nRT}{V}\right)^2 V = \text{constant}$$

$\therefore \quad T^2 \propto V$

or $\quad T \propto \sqrt{V}$

V is made three times. So, T will becomes $\sqrt{3}$ times.

13. A

Sol. $W_{net} = 2p_0V_0$

$Q_{+ve} = Q_{ABC} = W_{ABC} + \Delta U_{ABC}$

= area under the graph + $nC_V\Delta T$

$$= (3p_0V_0) + n\left(\frac{3}{2}R\right)(T_C - T_A)$$

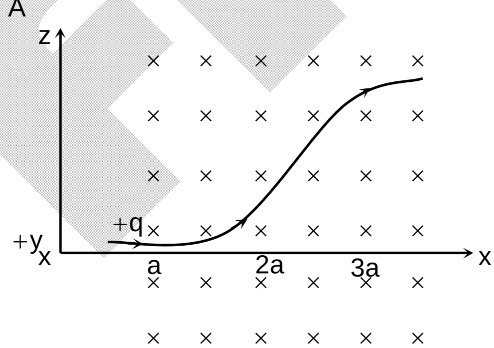
$$= (3p_0V_0) + \frac{3}{2}(p_CV_C - p_AV_A)$$

$= 10.5\ p_0V_0$

$$\eta = \frac{W_{net}}{Q_{+ve}} = \frac{4}{21}$$

14. A

Sol.



15. C

Sol. Conceptual

16. A

Sol. $\tan\phi = \frac{X_C}{R}$ $\frac{1}{\omega C} = R$

$\tan\frac{\pi}{4} = \frac{X_C}{R}$ $\frac{1}{\omega R} = C$

$X_C = R$

i leads emf $\therefore$ circuit is LC

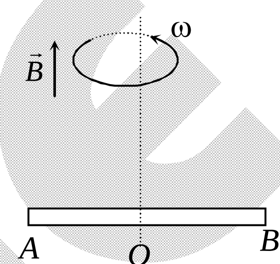
17. D

Sol. Potential difference between

O and *A* is $V_A - V_O = \frac{1}{2}Bl^2\omega$

O and *B* is $V_B - V_O = \frac{1}{2}Bl^2\omega$

So $V_A - V_B = 0$



18. B

Sol. $\lambda = \frac{h}{\sqrt{2mE}}$ $\Rightarrow$ $\lambda \propto \frac{1}{\sqrt{E}}$

$\Rightarrow$ $\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{E_2}{E_1}}$ $\Rightarrow$ $\frac{10^{-10}}{0.5\times10^{-10}} = \sqrt{\frac{E_2}{E_1}}$

$\Rightarrow$ $E_2 = 4E_1$

Hence added energy = $E_2 - E_1 = 3E_1$

19. A

Sol. Using Moseley's law, we get

$$\frac{\lambda_2}{\lambda_1} = \frac{(Z_1 - a)^2}{(Z_2 - a)^2}$$

$$\lambda_2 = \frac{200\times(74-1)^2}{(78-1)^2} = 179.76\ \text{Å}$$

20. C

Sol. ${}^x\lambda = \frac{\ln 2}{t_{1/2}}$

${}^y\lambda = \frac{\ln 2}{t_{1/2}}$

$\frac{{}^xA}{{}^yA} = \frac{{}^x\lambda\, {}^xN_0 e^{-{}^x\lambda t}}{{}^y\lambda\, {}^yN_0 e^{-2\lambda t}}$

$e^{\ln 2} = 2$

SECTION – B

21. 2

Sol. D_1 is reverse biased therefore it will act like an open circuit.

$$i = \frac{12}{6} = 2.00A$$

22. 3

Sol. Psueodo force and friction will make a force couple. Normal reaction and Mg will make a force couple.
When block is about the topple normal reaction will shift to edge.

23. 2

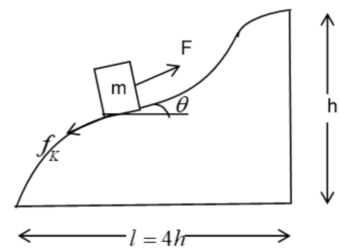
Sol. $\Delta W_f = -\int \mu mg \cos\theta ds$

$= -\mu mg \int_0^l dx$

$= -\mu mgl = 0.5mg4h = -2mgh$

$\Delta W_g = -mgh$

$\therefore \Delta W_{fr} / \Delta W_g = 2$



24. 5

Sol. $mg = kx$ (for m to leave the ground)

$m_0 gx = \frac{1}{2}kx^2$ or $m_0 = \frac{m}{2}$ = 5 kg

25. 4

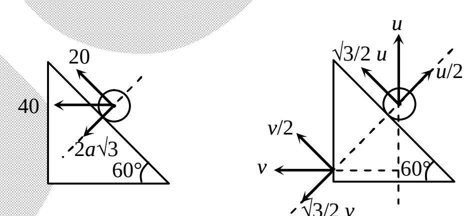
Sol. Conservation of momentum along horizontal

$m40 = 6 \times v$ …(i)

Newton's law of restitution

$\frac{u}{2} + \frac{\sqrt{3}}{2}v = 20\sqrt{3}$ …(ii)

Linear momentum of ball will remain conserved along inclined



Before Collision

$\frac{\sqrt{3}}{2}u = 20$

$u = \frac{40}{\sqrt{3}}$ …(iii)

From (i), (ii) and (iii)

m = 4 kg

Chemistry

PART – B

SECTION – A

26. C

Sol. Intensity of incident radiations depends on no. of photons in the incident light and simultaneously no. of photoelectrons increases and photoelectric current increases

27. A

Sol. In all the three options groups are arranged at ortho position. So after that the value of dipole moment will depend on the electro negativity difference.

28. C

Sol. For helium is a very light gas for which attraction is ignored and do not have vanderwall constant 'a' in the equation of compressibility factor and for helium Z > 1.

29. A

Sol. $Na_2CO_3 \longrightarrow NaHCO_3$ x

$NaHCO_3 \longrightarrow H_2CO_3$ x

$NaHCO_3 \longrightarrow H_2CO_3$ y

With phenolphthalein as indication 10 mL $\times$ 1N $\times$ 2

2 mill g. equation = x

with methyl orange as indicator

10mL $\times$ 0.2N $\times$ 4 milli gram equation = x + y

y = 2 mili gram eq.

Normality = $\frac{2\text{mill gram eq.}}{20\,\text{mL}} = 0.1\text{N}$

N = nf $\times$ molarity M = 0.05 M

30. D

Sol. For first order reaction, $t = \frac{2.303}{k}\log\frac{a}{a-x}$ $t_{99.9} = \frac{2.303}{k}\log\frac{100}{100-99.9} = \frac{2.303}{k}\times 3$

$t_{50} = \frac{2.303}{k}\log\frac{2.303}{k}\log 2 = \frac{2.303}{k}\times 0.301\; t_{99.9/t50} = 10\,\text{approx.}$

31. C

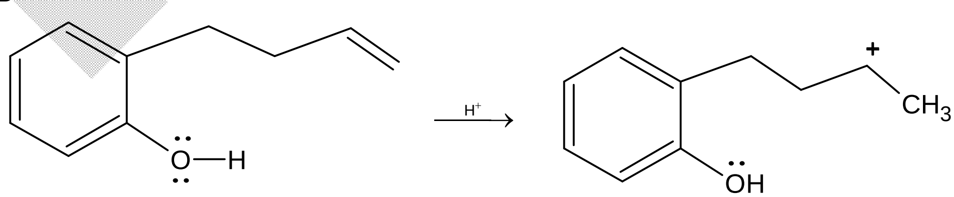
Sol. The cations will be liberated in the sequence of decreasing reduction potentials. Cations having E°value < –0.83 (reduction potential of water) will not be liberated from aqueous solutions

32. C

Sol. Iodine is a bulky group due to ortho effect mesomeric effect stops at ortho position & hence a and b will be longer than C bond

33. B

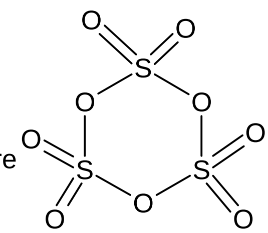
Sol.



More stable carbocation forms at this position

34. B
Sol. Benzilic acid involves transformation of α–diketones to α–hydroxyl acid by means of OH^-

35. C
Sol. CO_2, in CO_2 carbon is already in it's maximum oxidation state and cannot be oxidised further. While N, Cl, S are not in their maximum oxidation state.

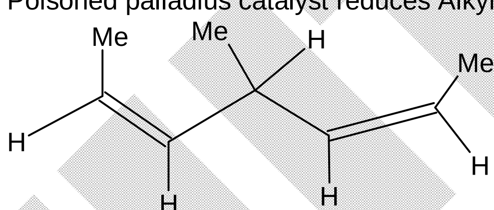
36. D
Sol. Structure  no S – S bonds

37. B
Sol. $[Co(NH_3)_2Cl_4]^-$ = cis and trans isomerism
$AuCl_2Br_2^-$ square planar cis and trans isomersim
$[Co(NO_2)]\ [NH_3]^{2+}$ = No isomerism

38. C
Sol. VBT is based on measurement of magnetic moment measurement. Based on that structure is being predicted.

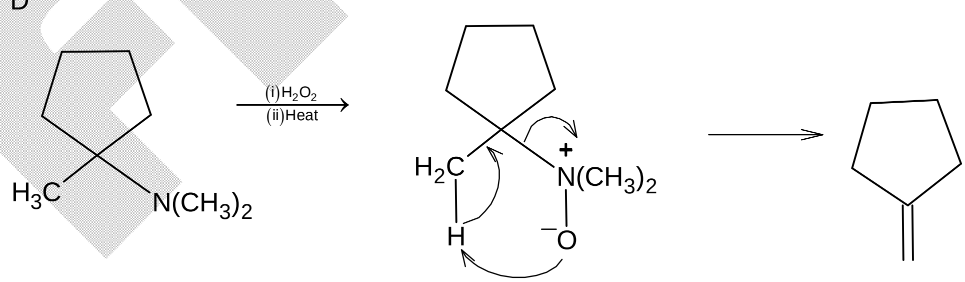
39. B
Sol. Fehlings solution can separate reducing and non-reducing sugars.
Glucose – Reducing sugar
Sucrose – non-reducing sugar.

40. B
Sol. Poisoned palladius catalyst reduces Alkyne to cis-Alkene.



Optically inactive product

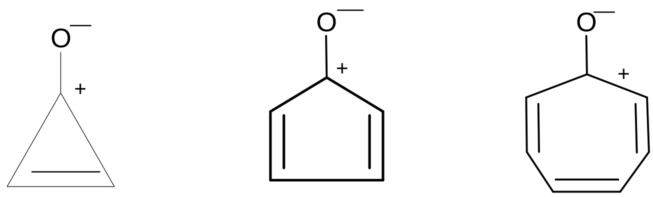
41. D
Sol.



Less stable alkene is the major product

42. B

Sol.



Aromatic Anti-aromatic Aromatic

Anti-aromatic is the least stable

43. A

Sol. Partial pressure of O_2 = $\frac{2}{7}\times 2660$ mm

Thus 1 L of O_2 is present at 0ºC and 760 mm

So no. of O_2 molecules = $\frac{0.02\times 10^{23}}{22.4}$

PV = nRT

No. of moles of O_2 = $\frac{1\text{atm}\times 1\text{L}}{0.0821^{-1}\text{atm}}\times 273\text{k} = \frac{1}{22.4}$

44. C

Sol. They have different bond connectivity. Hence constitutional isomers.

45. C

Sol. Zone refining is based on the principal that impurities are more soluble in molten state than solid state.

Hence molten zone contains more impurities than the original metal.

SECTION – B

46. 25

Sol.

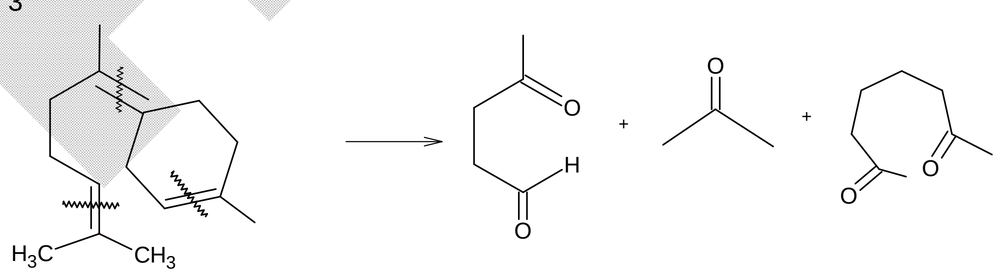
$$\begin{array}{cccc} AB_2 & \rightleftharpoons & AB(g) & + \; B(g) \\ 500 & & - & - \\ 500-x & & x & x \end{array}$$

Require = 600 torr = 500 – x + x + x, x = 100 torr

$K_p = \frac{P_{AB}\cdot P_B}{P_{AB_2}} = \frac{100\times 100}{400}$ = 25 torr

47. 3

Sol.



Three Products

48. 6470

Sol.

$$\begin{array}{cccc} H_2SO_4 & \rightleftharpoons & H^+ & + \; HSO_4 \\ x & & - & - \\ x-y & & y+Z & y-Z \end{array}$$

$$\begin{array}{cccc} H_2SO_4^- & \rightleftharpoons & H^+ & + \; SO_1^{a-} \\ y-Z & & Z+y & Z \end{array}$$

$K_{G_1} = \dfrac{(y-Z)(y+Z)}{x-y}$ $\qquad k_q \quad \dfrac{Z(Z+y)}{y-Z}$

$k_{a_1} = \infty, \; \therefore x = y$

$1.2\times10^{-2} = \dfrac{2\times10^{-2}}{y-Z}$

1.2 (y) – 1.22 = Z
1.2 y = 2.2Z
Y = 1.833Z
Y + z = 0.01
2.8332 = 0.01
Z = 0.0025
Y = 0.0064705 = x
$\therefore$ 6470.546

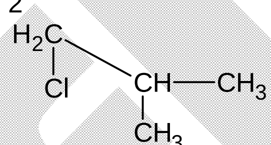
49. 2

Sol. d_{z^2} orbital has no mola plane.

$Fe(CO)_5 = dsp^2 = dz^2$
$MnO_4^- = d^3sw = d_{xy}$, d_{yz}, d_{x2}
$Co(C_2O_4)_3^{3-} = sp^3d^2 \quad d_{x^2-y^2}$ and d_{z^2}
$NiCl_2\,(PPh_3)_2 = dsp^2 = d_{x^2-y^2}$
$PtCl_4^2 = dsp^2 = d_{x^2-y^2}$
$Ni(CN)_4^2 = dps^2 = d_{x^2-y^2}$
$Ni(CN)_4^{4-} = sp^3$

50. 2

Sol.



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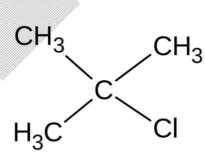


2 products

Mathematics

PART – C

SECTION – A

51. D

Sol. $\sin^{-1}\dfrac{|2\times3+(-1)\times6+2\times(-2)|}{\sqrt{2^2+(-1)^2+2^2}\cdot\sqrt{3^2+6^2+(-2)^2}}$

52. C

Sol. $\dfrac{dy}{dx}=\cos^{-1}x^4x^2$

$= - \cos^{-1}x^2$

$=\dfrac{2\pi}{3}\times\dfrac{1}{2^{1/4}}-\dfrac{\pi}{4}$

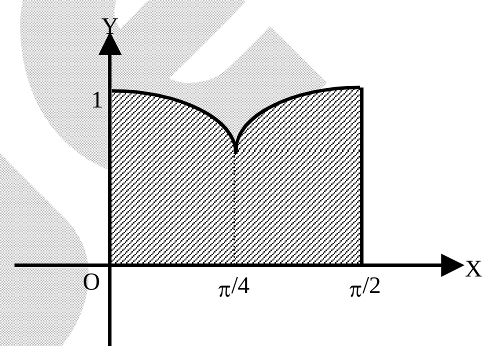
53. A

Sol. $f(x) = \cos x$ for $0 \le x \le \pi/4$

$= \sin x$ for $\pi/4 < x \le \pi/2$

Required $= 2\int_0^{\pi/4}\cos x\,dx = 2\sin x\,\Big|_0^{\pi/4}$

$= \sqrt{2}$ sq. units.



54. D

Sol. $(1-x^4)(1+{}^9C_1x+{}^9C_2x^2+{}^9C_3x^3\ldots\ldots\ldots\ldots{}^9C_9x^9)$

Coefficient of $x^7={}^9C_7-{}^9C_3=-48$

55. C

Sol. The chord of contact of tangents from (α, β) is

$\alpha x + \beta y = 1$ ..... (1)

Also, (α, β) lies on $2x + y = 4$, so that $2\alpha + \beta = 4$

$\Rightarrow \dfrac{\alpha}{2}+\dfrac{\beta}{4}=1$

Hence, (1) passes through $\left(\dfrac{1}{2}, \dfrac{1}{4}\right)$.

56. C

Sol. Equation of line is $(2x + 3y + 4) + \lambda(6x - 3y + 12) = 0$ ...(1)

(1) is normal to circle, therefore (1) passes through (2, 0)

$\Rightarrow \lambda = \dfrac{-1}{3}$ and required equation is $y = 0$.

57. A

Sol. $\Rightarrow 2y\dfrac{dy}{dx}x=-y^2-\sin 2x$ $\Rightarrow y^2+2yx\dfrac{dy}{dx}=-\sin 2x$

$\Rightarrow \frac{d}{dx}(xy^2) = \frac{d}{dx}(\cos^2 x)$ $\Rightarrow xy^2 = \cos^2 x + c$

58. D

Sol. $\begin{vmatrix} (a^x + a^{-x})^2 & (a^x - a^{-x})^2 & 1 \\ (b^y + b^{-y})^2 & (b^y - b^{-y})^2 & 1 \\ (c^z + c^{-z})^2 & (c^z - c^{-z})^2 & 1 \end{vmatrix}$

Operating $C_1 \to C_1 - C_2$

$$\begin{vmatrix} 4a^x a^{-x} & (a^x - a^{-x})^2 & 1 \\ 4b^y b^{-y} & (b^y - b^{-y})^2 & 1 \\ 4c^z c^{-z} & (c^z - c^{-z})^2 & 1 \end{vmatrix} = 4\begin{vmatrix} 1 & (a^x - a^{-x})^2 & 1 \\ 1 & (b^y - b^{-y})^2 & 1 \\ 1 & (c^z - c^{-z})^2 & 1 \end{vmatrix} = 0.$$

59. C

Sol. $0 < \frac{3}{x^2+1} \le 3$, $\frac{3}{x^2+1} = 2 \Rightarrow x = \frac{1}{\sqrt{2}}$ and $\frac{3}{x^2+1} = 1 \Rightarrow x = \sqrt{2}$

$$I = \int_0^{1/\sqrt{2}} 2dx + \int_{1/\sqrt{2}}^{\sqrt{2}} 1.dx + \int_{\sqrt{2}}^{\infty} 0\,dx = \sqrt{2} + \sqrt{2} - \frac{1}{\sqrt{2}} = 2\sqrt{2} - \frac{1}{\sqrt{2}} = \frac{3}{\sqrt{2}}.$$

60. C

Sol. $\int \frac{\ln x}{(1+\ln x)^2} dx$

Let $\ln x = t \Rightarrow dx = e^t\,dt$

$$\int \frac{te^t}{(1+t)^2} dt = \int \frac{e^t(t+1-1)}{(1+t)^2} dt$$

$$= \int \frac{e^t(t+1-1)}{(1+t)^2} dt$$

$$= \int e^t \left\{ \frac{1}{t+1} - \frac{1}{(1+t)^2} \right\} dt$$

$$= \frac{e^t}{t+1} + c \qquad \text{since } \int e^x(f(x) + f'(x))dx = e^x f(x) + c$$

$$= \frac{e^{\ln x}}{1+\ln x} + c = \frac{x}{1+\ln x} + c.$$

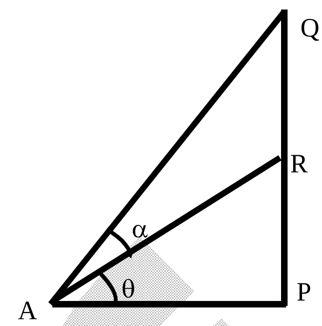
61. A

Sol. $f(x) = \log_{1/2}\log_4\log_3[(x-4)^2] \Rightarrow \log_4(\log_3[x-4)^2]) > 0 \Rightarrow \log_3[(x-4)^2] > 1$

$\Rightarrow [(x-4)^2] \ge 4 \Rightarrow (x-4)^2 - 4 \ge 0 \Rightarrow (x-2)(x-6) \ge 0$

$\Rightarrow x \in (-\infty, 2] \cup [6, \infty).$

62. A



Sol. $\tan(\theta + \alpha) = \frac{PQ}{AP} = \frac{1}{n}$

$\tan\theta = \frac{PR}{AP} = \frac{(1/2)PQ}{AP} = \frac{1}{2n}$

$\alpha = (\theta + \alpha) - \theta$

$\Rightarrow \tan\alpha = \frac{\tan(\theta+\alpha) - \tan\theta}{1 + \tan(\theta+\alpha)\tan\theta}$

$= \frac{\frac{1}{n} - \frac{1}{2n}}{1 + \frac{1}{n}\cdot\frac{1}{2n}} = \frac{n}{2n^2+1}$.

63. C

Sol. Normal to hyperbola will be

$ax\cos\theta + by\cot\theta = a^2 + b^2$

If this is same as $lx + my + n = 0$, comparing the coefficients,

$\frac{a\cos\theta}{l} = \frac{b\cot\theta}{m} = \frac{a^2+b^2}{-n}$

$\sec\theta = -\frac{an}{l(a^2+b^2)}$, $\tan\theta = \frac{-bn}{m(a^2+b^2)}$

$\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow \frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{(a^2+b^2)^2}{n^2}$.

64. A

Sol. Any point on the parabola is $(x, x^2 + 7x + 2)$

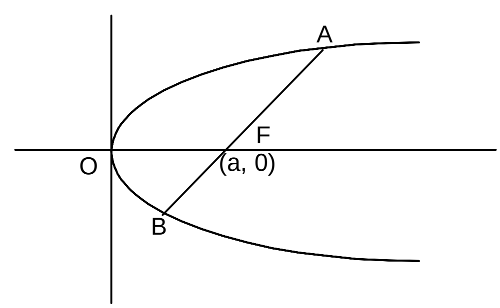
Its distance from the line $y = 3x - 3$ is given by

$P = \left|\frac{3x - (x^2+7x+2) - 3}{\sqrt{9+1}}\right| = \left|\frac{x^2+4x+5}{\sqrt{10}}\right| = \frac{x^2+4x+5}{\sqrt{10}}$ (as $x^2 + 4x + 5 > 0$ for all $x \in R$)

$\frac{dP}{dx} = 0 \Rightarrow x = -2$

The required point $\equiv (-2, -8)$.

65. A



Sol. FA = 4, FB = 5

We know that $\frac{1}{a} = \frac{1}{AF} + \frac{1}{FB}$

$\Rightarrow a = \frac{20}{9} \Rightarrow 4a = \frac{80}{9}$.

66. D

Sol. $\frac{n}{4n^4+1} = \frac{1}{4}\left[\frac{1}{2n^2-2n+1} - \frac{1}{2n^2+2n+1}\right]$

Hence $\sum_{n=1}^{k}\frac{n}{4n^4+1} = \frac{1}{4}\left[1 - \frac{1}{2k^2+2k+1}\right] = \frac{1}{4}$ as $k \to \infty$

67. C

Sol. $S - S_n < \frac{1}{300}$

$\Rightarrow \frac{1}{1-\frac{1}{3}} - \frac{1-\frac{1}{3^n}}{1-\frac{1}{3}} < \frac{1}{300} \Rightarrow \frac{3}{2}\left[1-1+\frac{1}{3^n}\right] < \frac{1}{300}$

$\Rightarrow \frac{1}{3^n} < \frac{1}{300} \times \frac{2}{3} \Rightarrow \frac{1}{3^n} < \frac{1}{450} \Rightarrow 3^n > 450$

$\therefore$ least value of n = 6

68. B

Sol. Let $f(x) = x^3 - 3x + a$

$f'(x) = 3x^2 - 3$.

For three distinct real roots (i) $f'(x) = 0$ should have two distinct real roots α and β and (ii) $f(\alpha) f(\beta) < 0$

Here $\alpha = 1$, $\beta = -1$.

Now $f(\alpha) f(\beta) < 0$

$\Rightarrow (1 - 3 + a)(-1 + 3 + a) < 0 \Rightarrow (a - 2)(a + 2) < 0$

$\Rightarrow -2 < a < 2$.

69. C

Sol. The line $y = \sqrt{3}x$ can be written as $x = \frac{r}{2}$, $y = \frac{r\sqrt{3}}{2}$.

If this line cuts the given curve, then

$\frac{r^4}{16} + \frac{ar^3\sqrt{3}}{8} + \frac{br^2\sqrt{3}}{4} + \frac{cr}{2} + \frac{dr\sqrt{3}}{2} + 6 = 0$.

Therefore OA. OB.OC.OD = $|r_1| |r_2| |r_3| |r_4| = |r_1 r_2 r_3 r_4| = 96$

70. C

Sol. Plane passing through (2, 2, 1) is $a(x - 2) + b(y - 2) + c(z - 1) = 0$

It passes through (9, 3, 6)

$\Rightarrow 7a + b + 5c = 0$ .... (1)

It is $\perp$ to $2x + 6y + 6z - 1 = 0$

$\Rightarrow 2a + 6b + 6c = 0$ .... (2)

(1) and (2) $\Rightarrow \frac{a}{-24} = \frac{b}{-32} = \frac{c}{40}$

$\Rightarrow \frac{a}{3} = \frac{b}{4} = \frac{c}{-5}$

$\Rightarrow$ The required plane is

$3(x - 2) + 4(y - 2) - 5(z - 1) = 0$

$\Rightarrow 3x + 4y - 5z - 9 = 0$.

SECTION – B

71. 9

Sol. $$S.D = \frac{\begin{vmatrix} 10 & 2 & 3 \\ 1 & -2 & 2 \\ 3 & -2 & -2 \end{vmatrix}}{\sqrt{8^2+8^2+4^2}} = \frac{108}{12} = 9$$

72. 0

Sol. Let $f(x) = x^3 + 2x^2 + 5x + 2\cos x$

$\Rightarrow f'(x) = 3x^2 + 4x + 5 - 2\sin x$

$$= 3\left(x+\frac{2}{3}\right)^2 + \frac{11}{3} - 2\sin x$$

Now $\frac{11}{3} - 2\sin x > 0\ \forall x$ (as $-1 \le \sin x \le 1$)

$\Rightarrow f'(x) > 0\ \forall x \Rightarrow f(x)$ is an increasing function.

Now $f(0) = 2$

$\Rightarrow f(x) = 0$ has no solution in $[0, 2\pi]$.

73. 5

Sol. $T_2 = {}^nC_1\, ab^{n-1} = 135$ .....(1)

$T_3 = {}^nC_2\, a^2 b^{n-2} = 30$ .....(2)

$T_4 = {}^nC_3\, a^3 b^{n-3} = 10/3$ .....(3)

Dividing (1) by (2)

$$\frac{{}^nC_1 ab^{n-1}}{{}^nC_2 a^2 b^{n-2}} = \frac{135}{30}$$

$$\frac{n}{\frac{n}{2}(n-1)}\frac{b}{a} = \frac{9}{2}$$

$$\frac{b}{a} = \frac{9}{4}(n-1) \quad .... (5)$$

Dividing (2) by (3)

$$\frac{\frac{n(n-1)}{2}}{\frac{n(n-1)(n-2)}{3.2}}\cdot\frac{b}{a} = 9$$

$$\therefore \frac{b}{a} = 3(n-2) \quad ....(6)$$

Eliminating a and b from (5) and (6)

$\Rightarrow n = 5$

74. 4

Sol. $k = |z - z_1|^2 + |z - z_2|^2 = |z_1 - z_2|^2 \quad \Rightarrow k = 4$

75. 8

Sol. $\frac{x^2}{4} + \frac{y^2}{3} = 1 \Rightarrow a = 2,\ b = \sqrt{3}$ and $e = \frac{1}{2}$

Sum of distances $= \frac{2a}{e} = \frac{4}{1/2} = 8$.