FIITJEE

ALL INDIA TEST SERIES

FULL TEST – VIII

JEE (Main)-2025

TEST DATE: 18-03-2025

ANSWERS, HINTS & SOLUTIONS

Physics **PART – A**

SECTION – A

1. C

Sol. Variation of moment of inertia with temperature

$I = I_o (1 + 2\alpha \Delta T)$

C.O.A.M:

$I_i\omega_i = I_f \omega_f$

2. D

Sol. Upon earthing, final potential of conductor becomes zero. Final charge may or may not be zero.

3. B

Sol. $\tan\theta = \dfrac{X_c - X_L}{X_R}$

and $\cos\theta$ = power factor.

4. A

Sol. $\Delta m = 0.1$ kg ; $\dfrac{\Delta m}{m} = \dfrac{0.1}{10}$

$\therefore$ Error $= \pm\dfrac{\Delta m}{m}\times 100 = \pm 1\%$.

5. A

Sol. $I_a = \frac{3V}{15R}, I_b = \frac{3V}{5R}$; $I_c = \frac{6V}{15R}$.

6. C

Sol. At first the pressure will increase rapidly and then it will become constant.

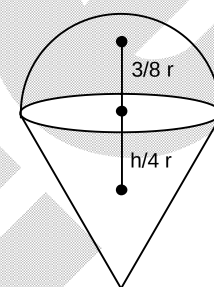
7. B

Sol. $F = \frac{dp}{dt} = \left(\sqrt{2}\,V\right)\frac{dm}{dt} = \left(\sqrt{2}\,V\rho\right)\frac{d(\text{volume})}{dt} = \left(\sqrt{2}\,V\rho\right)(AV)$

8. B

Sol. $\frac{3}{8}r \cdot \rho \frac{2}{3}\pi r^3 = \frac{h}{4} \cdot \rho \frac{1}{3}\pi r^2 h$

$\Rightarrow \quad h = \sqrt{3}\,r$



9. B

Sol. Kx = 2 × g = 20, $x = \frac{1}{2}$m

$5\,gx - \frac{1}{2}Kx^2 = \frac{1}{2}5V^2$

$V = 2\sqrt{2}$ m/s

10. D

Sol. $\Delta q = \Delta u + \Delta w$

$\Rightarrow \quad \Delta U = -996 \text{ J} = \frac{nR}{\gamma - 1}\Delta T$

$\gamma = \frac{5}{3}$ for mono-atomic gas.

11. C

Sol. $i = \frac{E}{R}\left(1 - e^{-\frac{tR}{L}}\right)$

12. A

Sol. $r = \frac{mv}{qB} = \frac{1 \times 10}{1 \times 2} = 5\text{m}$ And motion of particle will be in x – y plane.

13. A

Sol. $1000 = \left(\frac{350}{350 - 50}\right)f \quad \ldots(i)$

$$f_1 = \left(\frac{350}{350+50}\right)f \qquad \ldots(ii)$$

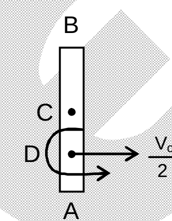
f_1 = 750 Hz

14. B

Sol. $B = 2\left[\frac{\mu_0 I}{4\pi r \cos 45^0}\right]\left(\sin 90^0 - \sin 45^0\right) + \frac{\mu_0 I}{4\pi r}\left(\frac{\pi}{2}\right)$

15. D

Sol. By COAM about point D (ie about new centre of mass)



$$MV_o \frac{L}{4} = \left[\frac{ML^2}{12} + \frac{ML^2}{16} + \frac{ML^2}{16}\right]\omega$$

or, $w = \frac{6v_o}{5L}$

Now, $t = \frac{\theta}{w} = \frac{(\pi/2)}{w} = \frac{5\pi L}{12v_o}$

16. D

Sol. $f = \frac{m}{2\ell}\sqrt{\frac{T}{\mu}}$; $n = \frac{2m+1}{4\ell}\sqrt{\frac{T}{\mu}}$

17. D

Sol. $T = 2\pi\sqrt{\frac{\ell}{g_{eff}}} = 2\pi\sqrt{\frac{\ell}{g+a}}$

18. C

Sol. Potential energy of particle at the centre of earth is $U = -\frac{3}{2}\frac{GMm}{R_e}$

So, $V_e = \sqrt{\frac{3GM}{R_e}} = \sqrt{3gR_e}$

19. C

Sol. $V_{AC} = 2 \times \left(\frac{0.2}{1.8+0.2}\right) \qquad \ldots(i)$

Also, $V_{AC} = (1.5)\left(\frac{5}{15}\right)\left(\frac{\ell}{100}\right) \qquad \ldots(ii)$

20. A

Sol. $V_o \cos\theta = V\sin\theta$

SECTION – B

21. 6

Sol. $\sqrt{f_1} = \sqrt{\frac{v}{\lambda_1}} = a(11-1)$ and $\sqrt{f_2} = \sqrt{\frac{v}{\lambda_2}} = a(Z-1)$

By dividing, $\sqrt{\frac{\lambda_2}{\lambda_1}} = \frac{10}{Z-1} \Rightarrow \sqrt{\frac{4}{1}} = \frac{10}{Z-1}$

$\Rightarrow$ Z = 6.

22. 15

Sol. Initially the rod will be in equilibrium if

$2T_o = Mg$ with $T_o = kx_o$ …(i)

when the current I is passed through the rod, it will experience a force

F = BIL vertically up,

In equilibriums

2T + BIL = Mg with T = kx …(ii)

from (i) & (ii)

$\frac{T}{T_o} = \frac{Mg - BIL}{Mg}$ i.e. $\frac{x}{x_o} = 1 - \frac{BIL}{Mg}$

or, $B = \frac{Mg(x_o - x)}{I\ L\ x_0}$

Putting the values we get $B = 1.5 \times 10^{-2}\,T$.

23. 20

Sol. $\frac{dN_A}{dt} = -\lambda_1 N_A$, $\frac{dN_B}{dt} = 2\lambda_1 N_A - \lambda_2 N_B$,

N_B = maximum $\Rightarrow \frac{dN_B}{dt} = 0$

$\Rightarrow \quad 2\lambda_1 N_A = \lambda_2 N_{B_{max}}$

$\Rightarrow \quad N_{B_{max}} = \frac{2\lambda_1}{\lambda_2} N_A$

$\Rightarrow \quad N_{B_{max}} = \frac{2\lambda_1}{\lambda_2} N_0 e^{-\lambda_1 t} = 2.$

24. 400

Sol. Here 3rd maxima is shifted by 3×10^{-4} m. It indicates fringe width increases by 1×10^{-4} m.

Hence $\beta = \frac{\lambda(D + 0.5)}{d} = \frac{\lambda D}{d} + 1 \times 10^{-4}$

or $\frac{0.5\lambda}{d} = 1 \times 10^{-4}$ m or $\lambda = \frac{2 \times 10^{-3} \times 1 \times 10^{-4}}{0.5} = 4 \times 10^{-7}$ m = 400 nm

25. 300

Sol. Let T be the tension in the ideal string and ‘a’ be the acceleration of the blocks at the instant of release. For the block on the left, the upward acceleration may be found from

$T + k_1x - mg = ma$

For the block on the right, the downward acceleration may be found from

$k_2x + mg - T = ma$

Adding the equations gives the acceleration of the blocks as

$a = (k_1 + k_2)x/(2m)$

However, subtracting the equations gives

$T = mg - (k_1 - k_2)x/2$

for maximum value of k_1T will be zero.

$mg = \left(\frac{k_1 - k_2}{2}\right)x$; $k_1 = 300$.

Chemistry

PART – B

SECTION – A

26. A
Sol. Using
$\Delta U = nC_V \times \Delta T$
$\Delta T = 100$ $n = 3.5$
$C_V = 2 \times 10^{-2}$
$\Delta U = 7$

27. B
Sol. NO_2 is the strongest electron withdrawing group among the given groups or atoms.

28. B
Sol. $4BCl_3 + 6H_2 + C \longrightarrow B_4C + 12HCl$
The reaction takes place in the preparation of bullet proof fabric B_4C.

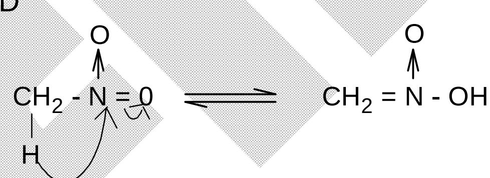
29. D
Sol. This is due to lanthanoid contraction on 6^{th} period.

30. B
Sol. It is most symmetrical.

31. B
Sol. $RCH_2CH_2OH \xrightarrow[\Delta]{Conc.H_2SO_4} R-CH=CH_2 + H_2O$

32. C
Sol. Octahedral complex with C.N number 6.

33. A
Sol. No free Cl^- in the ionisation sphere.

34. D
Sol.


35. B
Sol. $SiO_2 + 2NaOH \longrightarrow Na_2SiO_3 + H_2O$
$SiO_2 + Na_2CO_3 \longrightarrow Na_2SiO_3 + CO_2$

36. A
Sol. Having two possible donating site but donate from one only.

37. C

Sol. Due to double bond, the geometrical isomers are:

$$CH_3CH=CH-\underset{}{\overset{CH_3}{\overset{|}{C}H}}-CH=CH-CH_3$$

Cis	Cis
Trans	Trans
Cis	Trans
Trans	Cis

$\left.\begin{matrix}\text{Trans} & \text{Cis} \\ \text{Cis} & \text{Trans}\end{matrix}\right\}$ Identical

When the double bonds are Cis and trans, the molecule becomes optically active.

$\therefore$ For trans Cis(two optical isomers are possible)

$\therefore$ Total no. of stereoisomers are:

Geometrical (2) + Optical (2) = 4

38. B

Sol. It is least substituted alkene. Hence it is unstable.

39. B

Sol. $NH_4Cl \longrightarrow NH_4^+ + Cl^-$

$NH_4^+ + H_2O \longrightarrow NH_4OH + H^+$

H^+ shift the ionization reaction toward backward direction due to common ion effect.

40. C

Sol. $$CH_2=CH-\underset{C_2H_5}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_2CH_2Br \xrightarrow[R_2O_2]{HBr} BrCH_2CH_2-\underset{C_2H_5}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_2CH_2Br$$

Optically inactive

41. B

Sol. $Ni(impure) + 4CO \longrightarrow Ni(CO_4) \xrightarrow{\Delta} Ni(pure) + 4CO$

42. B

Sol. P = CaO, Q = Ca_3N_2, R = $Ca(OH)_2$, S = NH_3, T = $CaCO_3$, U = NH_2CONH_2

43. A

Sol. No. of radial nodes = (n – l – 1)

For 4s orbital, it is 3

For 4p orbital, it is 2

For 4d orbital, it is 1

For 4f orbital, it is 0

44. B

Sol. More double bond character, smaller bond length

45. B

Sol. Small size atomic orbitals undergo better overlap than larger atomic orbitals.

SECTION – B

46. 848

Sol. $E_n - E_1 = 12.75$

or $\frac{-E_1}{n^2} - E_1 = 12.75$ [E_1 = -13.6 eV(given)]

$\therefore$ n = 4

$r_n = \frac{n^2}{Z}a_0 = \frac{16}{1}(0.53) = 8.48\,\overset{o}{A}$ $\therefore$ $\frac{x}{100}$ = 8.48, x = 848

47. 106

Sol. M_{eq} of $KMnO_4$ = M_{eq} of $H_2C_2O_4$

(V) $\times$ (M)(n) = $\frac{W}{E} \times 1000$ Or, (200)(M)(5)=$\frac{56.7}{90/2} \times 1000$

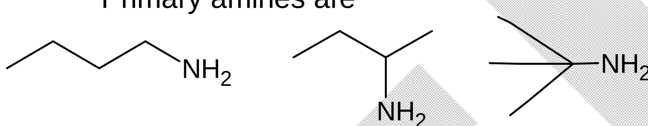
$\therefore$ M = 1.26

$\therefore$ $\frac{20+x}{100} = 1.26 \Rightarrow x = 106$

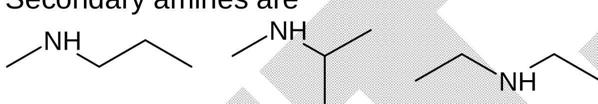
48. 7

Sol. x = 3, y = 3, z = 1

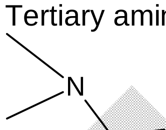
Primary amines are



Secondary amines are



Tertiary amine is



49. 3

Sol. $C_i = \sqrt{\frac{3RT}{M}}$

$C_f = \sqrt{\frac{3R(4.5)T}{\frac{M}{2}}} = 3\sqrt{\frac{3RT}{M}} = 3C_i$

You can take any velocity.

50. 8

Sol. $K_P = \frac{10^{-3}}{10^{-1}} = 10^{-2}$

ΔG^o = -2.303 RTlogK_P

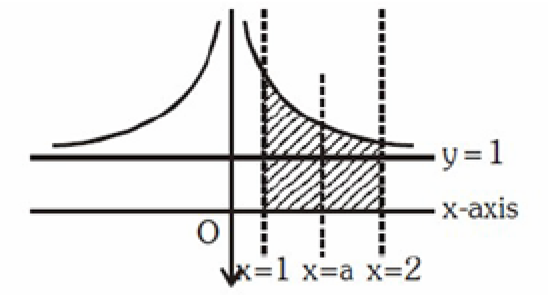
= -2.303 RTlog10^{-2} = (-4)(2 log10) = 8

Mathematics PART – C

SECTION – A

51. D

Sol. $\Rightarrow x-\frac{1}{x}\Big|_1^a = x-\frac{1}{x}\Big|_0^2$



$\Rightarrow 2\left(a-\frac{1}{a}\right)=\frac{3}{2}$

$\Rightarrow 4a^2-3a-4=0$

$\Rightarrow a=\frac{3+\sqrt{73}}{8}$

52. B

Sol. $\lim\limits_{y\to 0}\frac{\sqrt{1+\sqrt{1+y^4}}-\sqrt{2}}{y^4}$

$=\lim\limits_{y\to 0}\frac{1+\sqrt{1+y^4}-2}{y^4\left(\sqrt{1+\sqrt{1+4y^4}}+\sqrt{2}\right)}$

$=\lim\limits_{y\to 0}\frac{\left(\sqrt{1+y^4}-1\right)\left(\sqrt{1+y^4}+1\right)}{y^4\sqrt{\left(1+\sqrt{1+y^4}+\sqrt{2}\right)}\left(\sqrt{1+y^4}+1\right)}$

$=\lim\limits_{y\to 0}\frac{1+y^4-1}{y^4\left(\sqrt{1+\sqrt{1+y^4}}+\sqrt{2}\right)\left(\sqrt{1+y^4}+1\right)}$

$=\lim\limits_{y\to 0}\frac{1}{\left(\sqrt{1+\sqrt{1+y^4}}+\sqrt{2}\right)\left(\sqrt{1+y^4}+1\right)}=\frac{1}{4\sqrt{2}}$

53. C

Sol. As given $-\frac{b}{2a}=4$ and $-\frac{D}{4a}=2$

Hence, $E=abc=-16\left(a^2+8a^3\right)$

$\frac{dE}{da}<0$ for $a\in[1,3]$

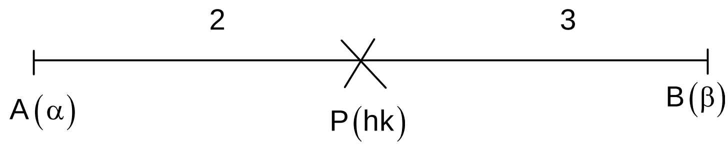
$E_{max}=-16\left(1^2+8.1^3\right)=-144$

$\Rightarrow|\lambda|=144$

$\frac{|\lambda|}{24}=6$

54. B

Sol. $\frac{PA}{PB}=\frac{2}{3}$



$$h=\frac{10\cos\beta+15\cos\alpha}{5}=2\cos\beta+3\cos\alpha$$
$$k=2\sin\beta+3\sin\beta$$
$$h^2+k^2=13+12\cos(\alpha-\beta)$$
$$x^2+y^2=13+12\cos(\alpha-\beta)$$

55. B

Sol. On solving, we have $z_1^3+z_2^3+z_3^3+z_1z_2z_3=0$

$$\Rightarrow (z_1+z_2+z_3)\left((z_1+z_2+z_3)^2-3z_1z_2-3z_2z_3-3z_3z_1\right)=-4z_1z_2z_3$$
$$\Rightarrow (z_1+z_2+z_3)^3=z_1z_2z_3\left(3(z_1+z_2+z_3)\left(\frac{1}{z_1}+\frac{1}{z_2}+\frac{1}{z_3}\right)-4\right)$$
$$\Rightarrow |z_1+z_2+z_3|^3=\left|3(z_1+z_2+z_3)(\bar{z}_1+\bar{z}_2+\bar{z}_3)-4\right|$$
$$\Rightarrow x^3=\left|3x^2-4\right|\Rightarrow x=1,2$$

56. B

Sol. $(3\sec\theta+5\operatorname{cosec}\theta)x+(7\sec\theta-3\operatorname{cosec}\theta)y+11(\sec\theta-\operatorname{cosec}\theta)=0$

$\sec\theta(3x+7y+11)+\operatorname{cosec}\theta(5x-3y-11)=0$

Hence point B is (1, –2)

Now proceed.

57. B

Sol. $$\frac{p(x)}{(2x-3)^2(3x-2)^2}=\frac{A}{2x-3}+\frac{B}{(2x-3)^2}+\frac{C}{3x-2}+\frac{D}{(3x-2)^2}$$

$f(x)$ is rational function

$B = D = 0$ and $P(x)=\lambda(2x-3)(3x-2)$

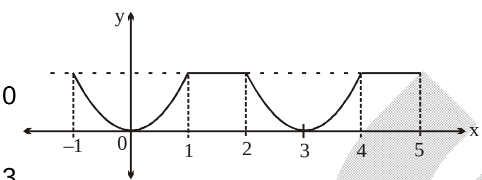
$P(1)=-\lambda=-1\Rightarrow\lambda=1$

$$\int\frac{dx}{(2x-3)(3x-2)}=\int\left[\frac{2}{2x-3}-\frac{3}{3x-2}\right]\frac{dx}{5}$$
$$=\frac{1}{5}\ell n\left|\frac{2x-3}{3x-2}\right|+C=\frac{1}{5}\ell n\left|\frac{4x-6}{3x-2}\right|+C'$$

$$\because \lim_{x\to\infty} f(x) = \frac{4}{3} \Rightarrow f(x) = \frac{4x-6}{3x-2}$$
$$= |f(1)| = 2$$

58. C

Sol.



$$f(x) = \begin{cases} x^2 & -1 \le x < 1 \\ 1 & 1 \le x \le 2 \end{cases} \Big\} \text{for } r = 0$$
$$\begin{cases} (x-3)^2 & 2 < x < 4 \\ 1 & 4 \le x \le 5 \end{cases} \Big\} \text{for } r = 3$$
$$\begin{cases} (x-6)^2 & 5 < x < 7 \\ 1 & 7 \le x \le 8 \end{cases} \Big\} \text{for } r = 6$$

From the graph of f(x), it is clear that f(x) is periodic with period 3.

Now $\sqrt{\int_0^{45} f(x)dx} = \sqrt{15\int_0^3 f(x)dx} = \sqrt{15\int_{-1}^{2} f(x)dx} = \sqrt{15\left[\int_{-1}^{1} x^2\,dx + \int_1^2 1\cdot dx\right]} = \sqrt{15\left(\frac{2}{3}+1\right)} = \sqrt{25} = 5$

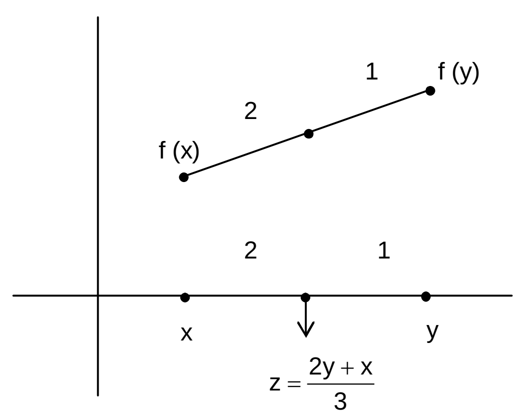
59. C

Sol. $\int_{-T/2}^{3T/2} f(x)dx = 18 \Rightarrow \int_0^{2T} f(x)dx = 18 \Rightarrow \int_0^T f(x)dx = 9$

$$\int_{-a}^{a+5T} f(x)dx = \int_{-a}^{a} f(x)dx + \int_a^{a+5T} f(x)dx$$
$$= 2\int_0^a f(x)dx + 5\int_0^T f(x)dx = 2\times 3 + 5\times 9 = 51$$

60. D

Sol. $g\left(\frac{x+2y}{3}\right) = \frac{2f(y)+f(x)}{3}$



$\Rightarrow g(x)$ is linear

$g(x) = mx + c$

$g'(x) = m = 1$

$g(x) = c = 2$

$\Rightarrow g(x) = x + 2$

$f(g(x)) = 2\tan^{-1}(x+2)$

$f^2(g(x)) - 5f(g(x)) + 4 > 0$

$(f(g(x)-1))(g(x)-4) > 0$

61. A

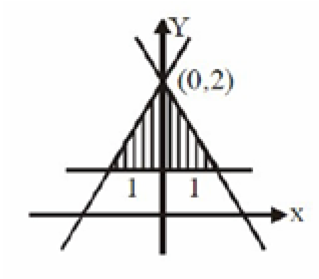
Sol. $x^2y - x^2 - y^3 + y^2 + 4y^2 - 4y - 4y + 4 = 0$

$\Rightarrow x^2(y-1) - y^2(y-1) + 4y(y-1) - 4(y-1) = 0$

$\Rightarrow (y-1)\left(x^2 - y^2 + 4y - 4\right) = 0$

$\Rightarrow y = 1 \text{ or } x^2 = (y-2)^2$

$\Rightarrow y = 1, x = y - 2 \text{ or } x = 2 - y$



Shaded area $= \frac{1}{2} \times 2 \times 1 = 1$ sq. units.

62. A

Sol. $d\left(x^2y\right) = d(xy) + d\left(xy^2\right)$

$\Rightarrow x^2y = xy + xy^2 + c$

at x = 1, y = 1 $\Rightarrow$ c = – 1

$\Rightarrow x^2y = xy + xy^2 - 1 \Rightarrow y = -y - y^2 - 1$

$\Rightarrow y^2 + 2y + 1 = 0 \Rightarrow y = -1$

$\therefore 12\left|y(-1)\right| = 12$

63. C

Sol. $x - y = 4$

To find equation of R

Slope of L = 0 is 1

$\Rightarrow$ Slope of QR = –1

Let QR is y = mx + c

$y = -x + c$

$x + y - c = 0$ distance of QR from (2, 1) is $2\sqrt{3}$

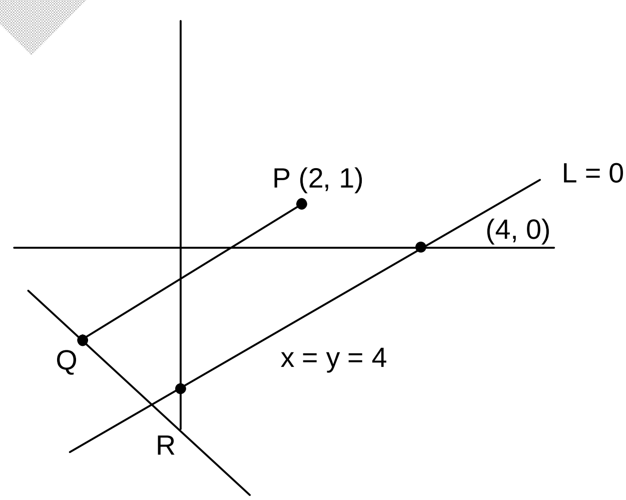
$2\sqrt{3} = \frac{|2+1-c|}{\sqrt{2}}$

$2\sqrt{6} = |3 - c|$

$c - 3 = \pm 2\sqrt{6} c = 3 \pm 2\sqrt{6}$

Line can be $x + y = 3 \pm 2\sqrt{6}$

$x + y = 3 - 2\sqrt{6}$



64. A

Sol. $(x-2)^2+(y-1)^2+\lambda(x-2y)=0$

$C: x^2+y^2+x(\lambda-4)+y(-2-2\lambda)+5=0$

$C_1: x^2+y^2+2y-5=0$

$S_1-S_2=0$

(Equation of PQ)

$(\lambda-4)x-(2\lambda+4)y+10=0$

Press through (0, –1)

$\Rightarrow \lambda=-7$

$C: x^2+y^2-11x+12y+5=0$

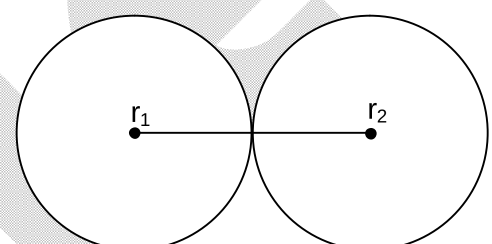
$=\frac{\sqrt{245}}{4}$

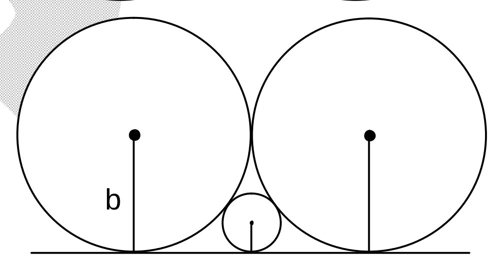
Diameter $=7\sqrt{5}$

65. C

Sol. Length of common tangent

$\Rightarrow \sqrt{(r_1+r_2)^2-(r_1-r_2)^2}$





$\sqrt{(a+b)^2+(a-b)^2}+\sqrt{(a+c)^2-(a-c)^2}$

$=\sqrt{(b+c)^2-(b-c)^2}$

$\sqrt{ab}+\sqrt{ac}=\sqrt{bc}$

$\frac{1}{\sqrt{c}}+\frac{1}{\sqrt{b}}=\frac{1}{\sqrt{a}}$

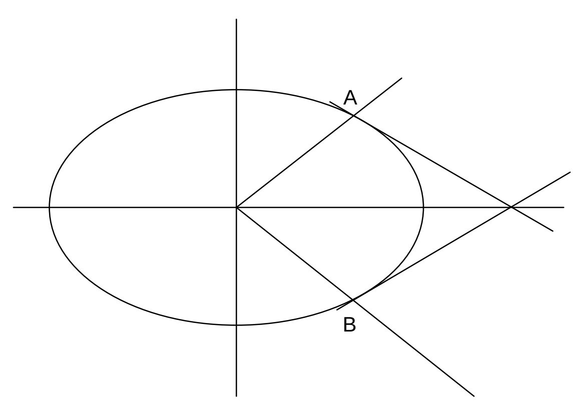
66. A

Sol. Equation of AB is $\frac{xb}{4}+ky=1$

Centroid equation of as OB = 4

$x^2+4y^2-4\left(\frac{xb}{4}+\frac{xy}{1}\right)^2=0$ ....(i)

$x^2+4y^2+\alpha xy=0$ ....(ii)



$\frac{h^2-4}{16}=\frac{k^2-4}{4}=\frac{br}{2h}$

$(h^2-4)=4(k^1-1)$

Locus is $x^2-4y^2=0$

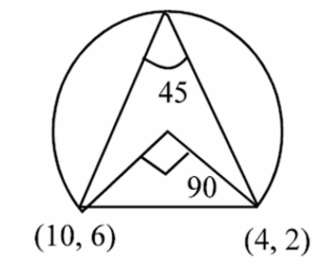
67. D

Sol. $\sqrt{2}r = \sqrt{(10-4)^2 + (6-2)^2}$

$= \sqrt{36+16} = 2\sqrt{13}$

$r = \sqrt{26}$

Perimeter $= \frac{3}{4} \times 2\pi r = \frac{3}{2}\pi\sqrt{26}$



68. A

Sol. $\sin^2 2\theta + \cos^4 2\theta = \frac{3}{4},\ \theta \in \left(0, \frac{\pi}{2}\right)$

$\Rightarrow 1 - \cos^2 2\theta + \cos^4 2\theta = \frac{3}{4}$

$\Rightarrow 4\cos^4 2\theta - 4\cos^2 2\theta + 1 = 0$

$\Rightarrow \left(2\cos^2 2\theta - 1\right)^2 = 0$

$\Rightarrow \cos^2 2\theta = \frac{1}{2} = \cos^2 \frac{\pi}{4}$

$\Rightarrow 2\theta = n\pi \pm \frac{\pi}{4},\ n \in I$

$\Rightarrow \theta = \frac{n\pi}{2} + \frac{\pi}{8}$

$\Rightarrow \theta = \frac{\pi}{8}, \frac{\pi}{2} - \frac{\pi}{8}$

69. B

Sol. $Sn = \sum_{n=3}^{\infty} \frac{1}{n^2 + n - 2};\ = \sum \frac{1}{(n+2)(n-1)}$

$= \sum \frac{1}{3}\left(\frac{1}{n-1} - \frac{1}{n+2}\right)$

$= \frac{1}{3}\left[\left(\frac{1}{2} - \frac{1}{5}\right) + \left(\frac{1}{3} - \frac{1}{6}\right) + \left(\frac{1}{4} - \frac{1}{7}\right) + \left(\frac{1}{5} - \frac{1}{8}\right) + \left(\frac{1}{6} - \frac{1}{9}\right) + \ldots\right]$

$= \frac{1}{3}\left[\frac{1}{2} + \frac{1}{3} + \frac{1}{4}\right] = \frac{13}{36}$

70. B

Sol. $\frac{1}{\sin 1}\left[\frac{\sin(1-0)}{\cos 0 \cos 1} + \frac{\sin(2-1)}{\cos 2 \cos 2} + \ldots + \frac{\sin(45-44)}{\cos 44 \cos 45}\right]$

$= \frac{1}{\sin 1}\left[\tan 1 - \tan 0 + \tan 2 - \tan 2 + \tan 3 - \tan 2 + \ldots + \tan 45 - \tan 44\right]$

$= \frac{1}{\sin 1}.[1-0]$

$= \frac{1}{\sin 1}$

$= \frac{1}{x}$.

SECTION – B

71. 101

Sol. $^{41}C_0 + {}^{41}C_1 + {}^{42}C_2 + ... + {}^{60}C_{20}$

$^{42}C_1 + {}^{42}C_2 + ... + {}^{60}C_{20}$

$\frac{61}{41}.\,{}^{60}C_{20} = \frac{m}{n}.\,{}^{60}C_{20}$

72. 6

Sol. Let $P = P\left(\frac{(A \cap B)}{(A \cup \bar{B})}\right) = \frac{P(A \cap B)}{P(A \cup \bar{B})}$

$\because\ A \cap B \subset A \cap \bar{B}$

$\Rightarrow p = \frac{P(A \cap B)}{1-(P(B)-PA \cap B)}$

$= \frac{\frac{1}{4}}{1-\frac{1}{3}+\frac{1}{4}}$

$= \frac{3}{11} \Rightarrow k = 6$

73. 6

Sol. Here equation of line is $\frac{x-2}{1} = \frac{y+3}{2} = \frac{z-4}{-3} = \lambda$ say ……(i)

Hence any point on the line (i) will be $p(\lambda+2, \lambda-3, -3\lambda+4)$

Given line (i) intersect the given plane

$2x+3y-z=13$ at the point P

$\Rightarrow \lambda = 2$

$\therefore P = (4,1,-2)$

also equation (i) intersects the YZ – plane at Q i.e. $x = 0$

$\therefore \lambda + 2 = 0 \quad \Rightarrow \quad \lambda = -2$

$\therefore Q = (0, -7, 10)$

74. 1

Sol. Total ways in which A and B can be chosen $= \left({}^5C_4 4!\right)^2 = (5!)^2$

Required probability = 1 – P (A and B does not contain 2)

$$=1-\frac{(4!)^2}{(5!)^2}=1-\frac{1}{25}=\frac{24}{25}=0.96$$

75. 0

Sol. Given, $\cos^{-1}\sqrt{p}+\cos^{-1}\sqrt{(1-p)}+\cos^{-1}\sqrt{(1-q)}=\frac{3\pi}{4}$

$$\Rightarrow \cos^{-1}\sqrt{p}+\cos^{-1}\sqrt{\left(1-\left(\sqrt{p}\right)^2\right)}+\cos^{-1}\sqrt{\left(1-\left(\sqrt{q}\right)^2\right)}=\frac{3\pi}{4}$$

$$\Rightarrow \cos^{-1}\sqrt{p}+\sin^{-1}\sqrt{p}+\cos^{-1}\sqrt{(1-q)}=\frac{3\pi}{4}$$

$$\frac{\pi}{2}+\cos^{-1}\sqrt{(1-q)}=\frac{3\pi}{4}$$

$$\therefore q=\frac{1}{2}$$