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A right Choice for the Real Aspirant

ICON Central Office – Madhapur – Hyderabad

SEC: Sr.Super60	**JEE-MAIN**	**Date: 23-03-2022**
Time: 09.00Am to 12.00Pm	**GTM-01**	**Max. Marks: 300**

KEY SHEET

PHYSICS

1	**2**	2	**1**	3	**3**	4	**2**	5	**1**
6	**1**	7	**2**	8	**3**	9	**4**	10	**2**
11	**1**	12	**1**	13	**4**	14	**3**	15	**4**
16	**3**	17	**1**	18	**3**	19	**2**	20	**4**
21	**20**	22	**3**	23	**60**	24	**175**	25	**144**
26	**9**	27	**5**	28	**30**	29	**2**	30	**200**

CHEMISTRY

31	**2**	32	**4**	33	**3**	34	**1**	35	**4**
36	**2**	37	**4**	38	**3**	39	**4**	40	**2**
41	**4**	42	**3**	43	**3**	44	**1**	45	**4**
46	**4**	47	**1**	48	**3**	49	**4**	50	**1**
51	**1**	52	**6**	53	**4**	54	**4**	55	**0**
56	**4**	57	**3**	58	**8**	59	**2**	60	**3**

MATHEMATICS

61	**3**	62	**3**	63	**3**	64	**3**	65	**1**
66	**2**	67	**3**	68	**3**	69	**4**	70	**1**
71	**3**	72	**3**	73	**3**	74	**1**	75	**3**
76	**4**	77	**3**	78	**4**	79	**4**	80	**2**
81	**20**	82	**2**	83	**1**	84	**5**	85	**0**
86	**1**	87	**2**	88	**6**	89	**2**	90	**575**

SOLUTIONS

PHYSICS

1. $P = \frac{\Delta T}{L} \Rightarrow K = \frac{PL}{\Delta TA} \qquad \Rightarrow K = \frac{100 \times 3 \times 10^{-3}}{10 \times 1.5} = 2 \times 10^{-2}$

2. $\overrightarrow{r_f} = \overrightarrow{r_i} + \Delta\overrightarrow{s_1} + \Delta\overrightarrow{s_2} + ...$

$\overrightarrow{r_f} = \left(2\hat{i} + 3\hat{j}\right) + 5\hat{i} + 8\hat{j} + \left(-2\hat{i} + 4\hat{j}\right) + \left(-6\hat{j}\right)$

$\overrightarrow{r_f} = 5\hat{i} + 9\hat{i}$ Distance from thrower $= \sqrt{5^2 + 9^2} = \sqrt{106}$

3. Dimension of z is dimension of time and only option C has dimension of time.

4. $i = \frac{V}{R+G} \qquad \frac{i}{2} = \frac{v}{\frac{SG}{S+G} + R} \times \frac{S}{S+G}$

$\Rightarrow \frac{2S}{SG + RG + RS} = \frac{1}{R+G} \qquad SG + SR = RG$

$\frac{SR}{R-S} = G \qquad R >> S \qquad \Rightarrow G \approx S$

5. $WD = \Delta QV \qquad \Rightarrow \qquad \Delta G = 4\mu C$

$Q_i = \frac{2 \times 4}{2+4} \times 6 = 8\mu C \quad Q_f = 12\mu C = C_{eq} \times 6$

$C_{eq} = 2\mu F \Rightarrow C_1 = C_2 = 4\mu F \qquad k = \frac{C_1}{C_0} = 2$

6. $x = \frac{\lambda D}{d} = \frac{700 \times 10^{-9} \times 5}{0.5 \times 10^{-3}} = 7mm$

7. $D = \frac{\mu_0 NI}{2\pi R}$

8. $F - N_1 = 0.5a \qquad N_1 - f_2 = 2a$

$f_2 = \mu N_2$

$f_1 = \mu_5 N_1 = 5N \qquad N_2 = 20 + f_1 = 25N$

$N_1 = \frac{1}{5}(25) = 2a$

$N_1 = 5 + 2a$

$\mu_s N_1 = mg$

$\frac{1}{2}(5 + 2a) = \left(\frac{1}{2}\right)(10)$

$2a = 5$

$a = 2.5 \ m/s^2$

9. W = area enclose in the cycle

$W = \frac{1}{2} 4 \times 10^{-4} \times 2 \times 10^5 = 40J$

10. Zero error is 3 division $LC = \frac{0.5}{50} = 0.01mm$

zero error = 0.03mm Reading = $5.0 + 29 \times 0.01$

$d = 5.29 - 0.03 = 5.26mm$

11. $P_{av} = \frac{W_{Total}}{time} = \frac{\frac{1}{2}mv^2}{time} = \frac{\frac{1}{2}(1550)(26.8)^2}{7.1} / 746$

= 105 hp

12. $\frac{1}{f} = \frac{1}{\infty} - \frac{2}{f_L}$

$\frac{1}{-6} = \frac{-2}{f_L}$ $f_L = 12cm$

$R = 12cm$ $\frac{1}{f} = \frac{1}{-12} - \frac{1}{24}$

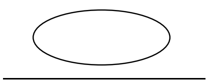
$f = -8$ $f_L = 16$

$\frac{1}{16} = \frac{1}{12} + \frac{1}{f}$ $f = -48$

$\frac{1}{-48} = \frac{(\mu - 1)}{-12}$

$\mu - 1 = \frac{1}{4}$

$\mu = \frac{5}{4}$

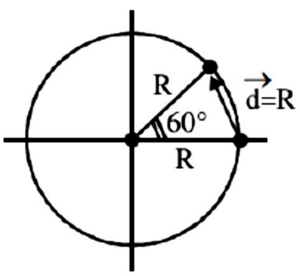


13.

As we know

$\omega = \frac{\pi t}{3}$

$\alpha = \frac{d\omega}{dt} = \frac{\pi}{3} \text{rad} / s^2$



$\theta = \frac{\pi}{3} = \frac{1}{2}\alpha t^2$

$$\frac{\pi}{3}=\frac{1}{2}(\pi/3)t^2$$

Now displacement of particle is given as d = R = 2m

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

14. $f=n\frac{v}{L}$ $\qquad \frac{df}{f}=\frac{dv}{v}$

$\frac{dv}{v}=\frac{1}{2}\frac{dT}{T}$ $\qquad v=\sqrt{\frac{\gamma RT}{M}}$

$df=f\frac{dv}{v}$ $\qquad =\frac{f}{2}\frac{dT}{T}$

$=\frac{10^4}{2}\times\frac{1}{300}=\frac{50}{3}$ $\quad =16.67HZ$

15. Conceptual

16. $v_1\ell_1=v_2\ell_2\, v_1=20$

$v_2=\frac{40}{3}$ $\qquad \frac{\ell_1}{\ell_2}=\frac{v_2}{v_1}=\frac{2}{3}$

17. $v=u\cos\theta+\frac{\sigma}{2\varepsilon_0}\frac{q}{m}\times\frac{u\sin\theta}{g}$

$$=u\cos\theta\left(1+\frac{q\sigma}{2\varepsilon_0 mg}\tan\theta\right)$$

18. $v=\sqrt{\frac{2gh}{1-\left(\frac{A_2}{A_1}\right)^2}}=\frac{\sqrt{2\cancel{0}\times 0\cancel{3}}}{\cancel{3}/4}$

$2\sqrt{2}\quad R=\frac{u^2\sin 120}{g}$

$=\frac{8\times\sqrt{3}/2}{10}=\frac{8\sqrt{3}}{20}$ $\qquad =\frac{2\sqrt{3}}{5}$

19. $M=\int kr4\lambda r^2dr$

$=\cancel{4}\pi k\frac{R^4}{\cancel{4}}$ $\qquad v=\sqrt{\frac{GM}{2R}}=\sqrt{\frac{G\lambda kR^4}{2R}}$

$$=\sqrt{\frac{\pi kR^3G}{2}}$$

20. $(B.E.)_y=(90\times1.008+138\times1.009-228.03)u$

= 1.932 u $=1.932\times931.5MeV$

Hence Binding energy is per Nucleon is

$$=\frac{1.932\times 931.5}{228} \qquad =7.89\text{ MeV}$$

21. $$E_x=-\frac{\partial v}{\partial x}=-6\hat{i}$$

$$E_y=-\frac{\partial v}{\partial y}=-8\hat{j} \quad E_z=\frac{\partial v}{\partial z}=-8z\hat{k}$$

$$\vec{E}_{net}\ at\ orgin=\sqrt{6^2+8^2}=10$$

$$\Rightarrow\left|\overline{F}\right|=\left|q\overline{E}\right|=20N$$

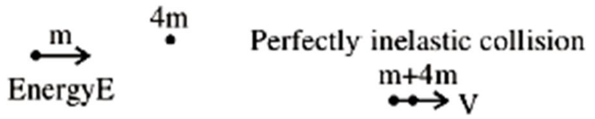
22. Induced field in rod, E = vB

electric field on surface of sphere $=\frac{KQ}{R^2}$

$$\frac{KQ}{R^2}=vB\Rightarrow R^2=\frac{kQ}{vB}=\frac{9\times 10^9\times 30}{9\times 1}$$

$$R=\sqrt{3}\times 10^5=1.73\times 10^5$$

23. For all collision to take place electron has to excite to n = 3.



$$mu+0=5mV \qquad \text{Loss }=\frac{1}{2}mu^2-\frac{1}{2}5m\times\left(\frac{4}{5}\right)^2=\frac{4E}{5}$$

$$\frac{4E}{5}=12.09\times(2)^2 eV \quad \Rightarrow E=60.45eV$$

24. $$\frac{f_{\max}}{\Delta f_{half\ of\ \max\ power}}=\text{Quality factor}$$

$$\frac{x_c}{R}=\text{Quality factor}$$

25. Impulse on block $=\left(\frac{IA}{C}\right)\cos^2 53^0\times(\Delta t)$

$$=\frac{(20)(10\times 10^{-4})}{3\times 10^8}\times(0.6)^2\times 6\times 10^{-3}$$

$$=\frac{72}{5}\times 10^{-14}kg\,m/s$$

Now we have Impulse = mv

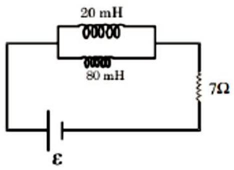
$$\frac{72}{5}\times 10^{-14}=1\times 10^{-9}v \quad v=\frac{72}{5}\times 10^{-5}m/s$$

Now we have $\frac{1}{2}kx^2=\frac{1}{2}mv^2$

$$10^{-5}x^2=10^{-9}\times\frac{72}{5}\times 10^{-5}\times\frac{72}{5}\times 10^{-5}$$

$x=\frac{72}{5}\times10^{-7}m \qquad N=\frac{7.2}{5}=1.44$

26.



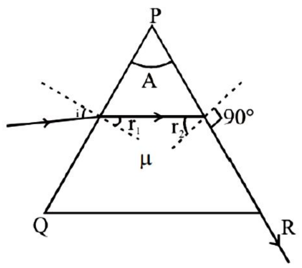
$\tau=\frac{L_{eq}}{R_{eq}}=\frac{16\times10^{-3}}{8}=2ms \qquad i=i_0\left(1-e^{\frac{-t}{\tau}}\right) \qquad \frac{99}{100}i_0=i_0\left(1-e^{\frac{-t}{\tau}}\right)$

$e^{\frac{-t}{\tau}}=0.01; \frac{-t}{\tau}\ln(0.01) \quad \frac{t}{\tau}=\ln(100)$ t = 9.2 ms

27. $\frac{\Delta g}{g}=\frac{\Delta\ell}{L}+\frac{2\Delta T}{T}=\frac{0.1}{95.6}+2\times\frac{1}{41}$

$=\frac{41+956\times2}{956\times41}\approx\frac{2}{41}\approx5\%$

28.



for this condition, $r_2=\theta_c, r_1=A-\theta_c$

$1\sin i=\mu\sin r_1 \qquad \sin i=\mu\sin(A-\theta_c)=\mu(\sin A\cos\theta_c-\cos A\sin\theta_c)$

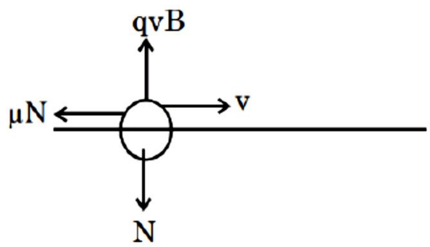
$=\mu\left(\sin60^0\frac{\sqrt{\mu^2-1}}{\mu}-\cos60^0\times\frac{1}{\mu}\right)$

$=\frac{\sqrt3}{2}\times\frac{2}{\sqrt3}-\frac{1}{2}=\frac{1}{2} \qquad i=30^0$

29. $0^2=v^2-2\mu_k gS_{rel}$

$\frac{9}{2\times2}=S_{rel}=2.25m$

30.



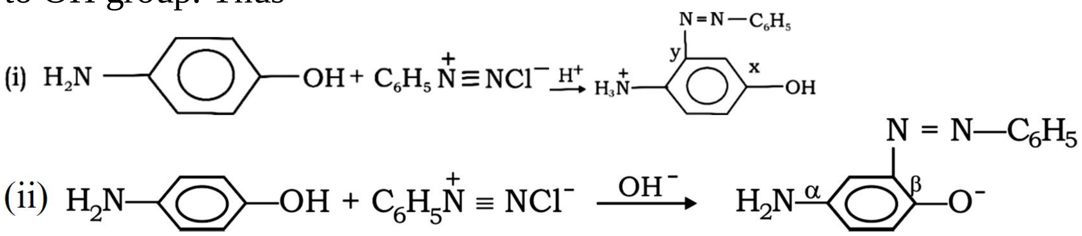
$N=qvB \quad -\mu qvB=\frac{mdv}{dt}=mv\frac{dv}{dS} \qquad \mu qBS=mv \quad S=\frac{3\times10^{-6}\times4}{0.3\times10^{-6}\times0.2}=200m$

CHEMISTRY

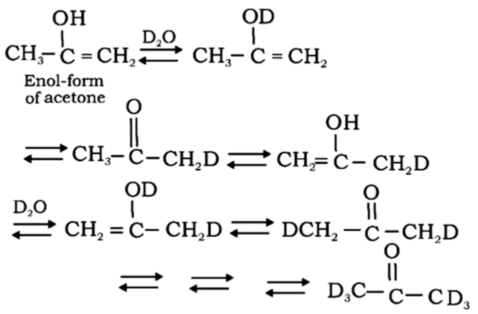
31. Vander Waal's constants
32. $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$
33. The dehydration of secondary and tertiary alcohols to give corresponding ethers is unsuccessful as elimination competes over substitution and therefore, alkenes are easily for the dehydration of secondary and tertiary alcohols to give corresponding ethers is unsuccessful as elimination competes over substitution and therefore, alkenes are easily formed
34. Salicylic acid because it stabilizes the corresponding salicylate ion by intramolecular H-bonding
35. All are correct statements
36. There are three d orbital's or involve
37. Mid row effect
38. $ICl_2^- = \text{linear (sp}^3\text{d hybridisation)}$, $BrF_2^+\ (BrF_3 - F) = \text{Angular}$

    $ClF_4^- = \text{square planar (sp}^3\text{d}^2\text{ hybridisation)}$,

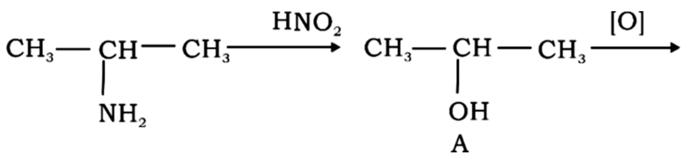
    $AlCl_4^- = \text{tetrahedral (sp}^3\text{ hybridisation)}$.
39. In acid medium coupling occurs o/p-to $-NH_2$ group while in basic medium, it occurs o/p-to OH group. Thus



40. The enol-form of acetone on treatment with D_2O undergoes repeated enolization and deuteration to give ultimately $CD_3 - CO - CD_3$



41. Electrophilic addition
42.



$$CH_3-CO-CH_3 \xrightarrow[\text{(ii) } H^+/H_2O]{\text{(i) } CH_3MgI} (CH_3)_3COH$$

B 1,1–Dimethylethanol

43. $2Al + 6HCl(dill) \rightarrow 2AlCl_3 + 3H_2$

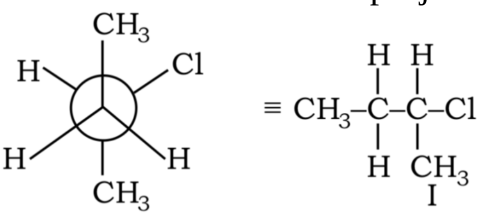
    $2Al + 2NaOH + 6H_2O \rightarrow 2a\left[Al(OH)_4 + 3H_2\right.$
44. $P_4 + 20HNO_3 \rightarrow 4H_3PO_4 + 20NO_2 + 4H_2O$

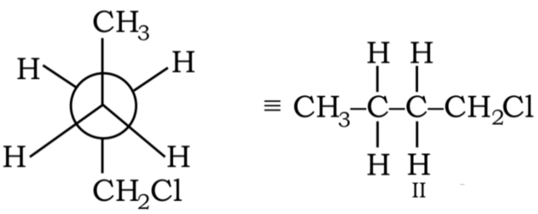
45. Adsorption of sulphide particles on air bubble takes place in froath floatation process.

46. Both are not double salts

47. In acidic solution, NH_3 forms a bond with H^+ to give NH_4^+ ion which doesnot have a lone pair on N to act a ligand.

48. Convert these Newmann projections into open chain structures:





Structures I and II being position isomers are, in fact, structural isomers.

49. $\Delta S = C_v \ln\frac{T_2}{T_1} + R\ \ln\frac{V_2}{V_1} = C_v \ln\ 2 + R\ \text{In}\ \frac{1}{2}$

$= C_v \ln 2 - R\ \ln\ 2\ \ = (C_v - R)\ln 2$

50. Soap + water is an example of micelles

51. Equilibrium is attained

52. It is dehydrohalogenation reaction

53. Toulene

54. $\mu = 4.9BM = \sqrt{n(n+2)}$

Number of unpaired electrons = 4

4 unpaired electrons are present, if the ion is Cr^{2+}

In a total of 22 electrons $(1s^2 2d^2 2p^6 3s^2 3p^6 3d^4)$,

13 electrons are with one spin and remaining 9 electrons are with opposite spin.

55. Mond's process

56. stoichiometric coefficient is 4

57. Molecular weight of $MF_X = 96$+(atomic weight of F) $\times x$

$= (96 + x19)$

100 g water contains $\rightarrow \left(\frac{41.2}{96 + x \times 19}\right)_{\text{mole of}}\ MF_3$

$\Rightarrow \frac{412}{96+19x} = \text{molarity}$

$M' = \frac{\Delta T}{K_f}$ $\qquad M' = \frac{1.38}{0.512} \ldots.(1)$

$\frac{1.38}{0.512} = \frac{412}{96+19x} \quad \Rightarrow x = 3$

58. $p^H = \dfrac{p^{K_a}\left(HA^{2-}\right) + p^{K_a}\left(H_2A^-\right)}{2} \qquad = \dfrac{11+5}{2} = \dfrac{16}{2} = 8$

59. $2\left(r^+ + r^-\right) = 3.2; r^+ + r^- = 1.6; r^+ = 1.6 - 1.4 = 0.2A^0$

$= 2\times10^{-1}A^0 \Rightarrow x = 2$

60. After 2 seconds surface area becomes 1/4 th. Hence radius becomes 1/2 of initial therefore vol will become 1/8 th dissolved vol = 7/8

mass dissolved $= 7/8 \times 1/7 = 1/8gm$

molarity = $\dfrac{1}{8\times125} = \dfrac{1}{1000} = 10^{-3}$ q = 0.77V.

MATHEMATICS

61. Given lines x + 1 = 0, y + 1 = 0

Pair of angle bisector

$$\left(\frac{x+1}{\sqrt{1}}\right)^2-\left(\frac{y+1}{\sqrt{1}}\right)^2=0 \Rightarrow x^2+2x+1-y^2-2y-1=0$$

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

62. $C_1+C_2\to C_1$

$$\begin{vmatrix}2 & 1+\cos^2 x & \cos 2x\\ 2 & \cos^2 x & \cos 2x\\ 1 & \cos^2 x & \sin 2x\end{vmatrix}$$

$R_1-R_2\to R_1$

$$\begin{vmatrix}0 & 1 & 0\\ 2 & \cos^2 x & \cos 2x\\ 1 & \cos^2 x & \sin 2x\end{vmatrix}$$

Open w.r.t. R_1 –(2 sin 2x – cos 2x)

cos 2x – 2 sin 2x = f(x) $f(x)\big|_{max}=\sqrt{1+4}=\sqrt{5}$

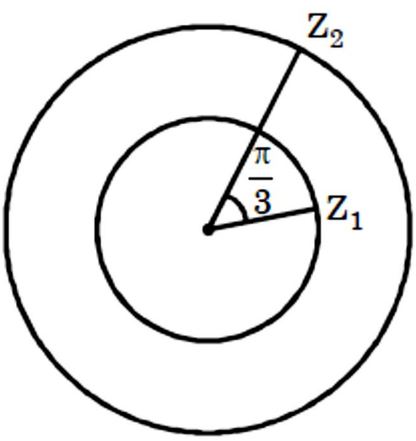
63. $$\frac{dy}{dx}=1+\frac{y}{x}+\frac{y^2}{x^2}$$

$y=vx \quad \frac{dy}{dx}=v+x\frac{dv}{dx}$

$v+x\frac{dv}{dx}=1+v+v^2 \quad \frac{dv}{1+v^2}=\frac{dx}{x}$

$\tan^{-1}(v)=\ell nx+c \quad c=\frac{\pi}{4} \quad y=x\tan\left(\ell nx+\frac{\pi}{4}\right)$

64.



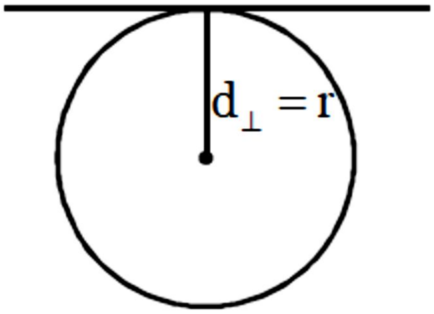
$$|z_1+z_2|=\sqrt{|z_1|^2+|z_2|^2+2|z_1||z_2|\cos\theta}$$

$$=\sqrt{4+9+2\times 2\times 3\times\frac{1}{2}} \quad \sqrt{4+9+6}=\sqrt{19}$$

65. Equation of tangent is

$$\frac{x\cos\phi}{4}+\frac{\sqrt{11}\sin\phi}{16}y=1$$

is also tangent to $(x-1)^2+y^2=16$



$$\left|\frac{\frac{\cos\phi}{4}-1}{\frac{\cos^2\phi}{16}+\frac{11\sin^2\phi}{256}}\right|=4 \quad \phi=\pm\frac{\pi}{3}$$

66. Plane passing through (42, 0, 0), (0, 42, 0), (0, 0, 42)
From intercept from, equation of plane is x + y + z = 42
$\Rightarrow (x-11)+(y-19)+(z-12)=0$
let a = x – 11, b = y – 19, c = z – 12
a + b + c = 0 Now, given expression is

$$3+\frac{a}{b^2c^2}+\frac{b}{a^2c^2}+\frac{c}{a^2b^2}-\frac{42}{14abc}$$

$$3+\frac{a^3+b^3+c^3-3abc}{a^2b^2c^2} \quad \text{If } a+b+c=0$$

$$\Rightarrow a^3+b^3+c^3=3abc \quad \Rightarrow 3$$

67. $$I=\int_0^\infty \frac{\tan^{-1}x}{(x+1)^2}dx$$

Put $x=\frac{1}{t}\Rightarrow dx=-\frac{1}{t^2}dt$

$$=\int_\infty^0 \frac{\tan^{-1}\left(\frac{1}{t}\right)}{\left(\frac{1}{t}+1\right)^2}\left(\frac{-1}{t^2}\right)dt=\int_0^\infty \frac{\cot^{-1}t}{(1+t)^2}dt=I$$

$$2I=\frac{\pi}{2}\int_0^\infty \frac{1}{\left(1+t^2\right)}dt\Rightarrow I=\frac{\pi}{4}$$

68. Consider all those cases where teacher is making visit to the zoo not taking A (one of the student out of 20). Hence teacher is selecting 2 students from rest 19. Hence ${}^{19}C_2$ visits are there which do not include A.

69. Let equation of plane containing line be : $\ell(x-1)+m(y+2)+nz=0$ then

$2\ell-3m+5n=0$ and $\ell-m+n=0$

$\therefore$ plane is 2(x – 1) + 3(y + 2) + z = 0

i.e., 2x + 3y + z + 4 = 0 $\therefore$ a = 2, b = –3 , c = 1

$$\Rightarrow \frac{b^2}{(a+c)}=\frac{9}{3}=3$$

70. $\therefore f^2(x)=\int_0^x \frac{tf(t)}{1+t^2}$

$$\therefore 2f(x)f'(x)=\frac{xf(x)}{1+x^2};f(x)=0 \text{ (not possible)}$$

$$\therefore f'(x)=\frac{x}{2(1+x^2)} \Rightarrow f(x)=\frac{1}{4}\ell og(1+x^2)+C$$

$$\therefore f(0)=0 \Rightarrow C=0 \;\; \therefore f(x)=\frac{1}{4}\ell og(1+x^2) \quad \Rightarrow f(e^4-1)=1$$

71. $I=\int_0^{10}[x].e^{[x]-x+1}$

$$I=\int_0^1 0\,dx+\int_1^2 1.e^{2-x}+\int_2^3 2.e^{3-x}+.....+\int_9^{10} 9.e^{10-x}dx$$

$$\Rightarrow I=\sum_{n=0}^{9}\int_n^{n+1} n.e^{n+1-x}dx \;\; \Rightarrow -\sum_{n=0}^{9} n\left(e^{n+1-x}\right)_n^{n+1}$$

$$=-\sum_{n=0}^{9} n.\left(e^0-e^1\right) \quad =(e-1)\sum_{n=0}^{9} n$$

$$=(e-1)\frac{9.10}{2} \qquad = 45\,(e-1)$$

72. $y'=\frac{-\sin 2x}{(2+\cos^2 x)^2}=0 \Rightarrow \sin 2x=0 \Rightarrow x=\frac{n\pi}{2}$

if n odd x = $(2k+1)\frac{\pi}{2}$ $\qquad y=\frac{1}{2}$

if n even $x=(2k)\frac{\pi}{3}$ $\qquad y=\frac{1}{3}$

73. Tangent vertex equation $\frac{x}{3}+\frac{y}{4}=1$

So are = $\frac{1}{2}.3.4=6$

Locus of the foot of the perpendicular from focus to tangents is tangent at vertex.
So tangent at vertex passes through (3, 0) and (0, 4).

74. We can conclude $-8a+4b-2c+5=0$

$12a - 4b + c = 0$

$c = 3 \quad a=-\frac{1}{2} \qquad b=-\frac{3}{4} \qquad c = 3$

$$c+2b+a=3-\frac{3}{2}-\frac{1}{2}=1$$

75. $x^2+y^2+ax+2ay+c=0$

$$2\sqrt{g^2-c}=2\sqrt{\frac{a^2}{4}-c}=2\sqrt{2}$$

$$\Rightarrow \frac{a^2}{4}-c=2 \qquad \ldots\ldots. (1)$$

$$2\sqrt{f^2-c}=2\sqrt{a^2-c}=2\sqrt{5}$$

$$\Rightarrow a^2-c=5 \qquad \ldots\ldots. (2)$$

(1) & (2)

$$\frac{3a^2}{4}=3\Rightarrow a=-2\,(a<0)$$

$\therefore c=-1$

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

$$\Rightarrow (x-1)^2+(y-2)^2=6$$

Given x + 2y = 0 $\Rightarrow m=-\frac{1}{2}$

$m_{\tan gent}=2$ Equation of tangent

$$\Rightarrow (y-2)=2(x-1)\pm\sqrt{6}\sqrt{1+4}$$

$$\Rightarrow 2x-y\pm\sqrt{30}=0$$

Perpendicular distance from (0, 0) = $\left|\frac{\pm\sqrt{30}}{\sqrt{4+1}}\right|=\sqrt{6}$

76. Given lines in the form a(1) + b(–2) + c = 0

Being lines concurrent, triangle will not form.

77. $f(x)=\sum_{n=1}^{\infty}\sin\frac{2x}{3^n}.\sin\frac{x}{3^n}$

$$=\frac{1}{2}\sum_{n=1}^{\infty}\left(\cos\frac{x}{3^n}-\cos\frac{x}{3^{n-1}}\right) \quad =\frac{1}{2}\lim_{x\to\infty}\sum_{n=1}^{n}\left(\cos\frac{x}{3^n}-\cos\frac{x}{3^{n-1}}\right)$$

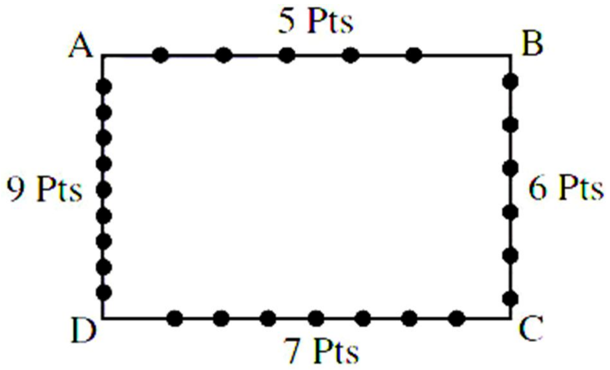
$$=\frac{1}{2}\lim_{x\to\infty}\left(\cos\frac{x}{3^n}-\cos x\right)=\frac{1-\cos x}{2}$$

$\therefore f(x)=0\Rightarrow x=2n\pi, x\in Z \qquad 628<200\pi$

$$\therefore \text{Sum} = 2\pi+4\pi+.....+2.99\pi=\frac{2.99.100}{2}\pi=9900\pi$$

78. $x|x|$ is differentiable at x = 0, hence 1, 3 are points of non differentiability.

79.



α = Number of triangles

α = 5.6.7 + 5.7.9 + 5.6.9 + 6.7.9

= 210 + 315 + 270 + 378

= 1173 β = Number of quadrilateral

β = 5.6.7.9 = 1890 $\beta - \alpha$ = 1890 – 1173 = 717

80. Let $x = a\sec\theta$

$y = b\operatorname{cosec}\theta$

$$\sqrt{x^2+y^2} = \sqrt{a^2\sec^2\theta + b^2\operatorname{cosec}^2\theta} \geq a+b$$

81. $$\sqrt{1+\frac{1}{a^2}+\frac{1}{(a+1)^2}} = \frac{a^2+a+1}{a(a+1)} = 1+\frac{1}{a}-\frac{1}{a+1}$$

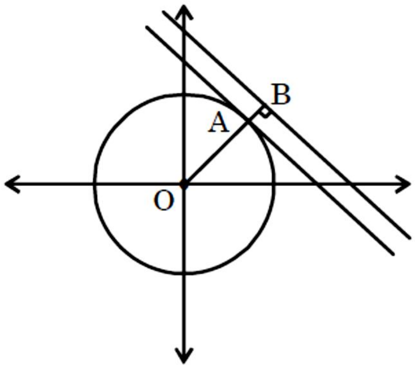
$$\sum_{a=1}^{19}\sqrt{1+\frac{1}{a^2}+\frac{1}{(a+1)^2}} = 19+\frac{1}{1}-\frac{1}{19+1} = 20-\frac{1}{20} \text{ and}$$

$$\frac{x}{20} = \frac{1+\left(1-\frac{1}{2}\right)+\left(1-\frac{2}{3}\right)+\left(1-\frac{3}{4}\right)+\ldots\ldots\ldots+\left(1-\frac{24}{25}\right)}{1+\frac{1}{2}+\frac{1}{3}+\ldots\ldots\ldots+\frac{1}{25}}$$

$$\frac{x}{20} = 1 \Rightarrow x = 20$$

82. $|z_1| = 2$ and $(1-i)z_2 + (1-i)\overline{z_2} = 8\sqrt{2}$

$\therefore$ $x^2+y^2 = 4$ and $x+y = 4\sqrt{2}$



AB = OB – r

$= 2$

83. Let 'θ'be the angle between $\vec{a}$ and $\vec{b}$ then

$\because \quad \left|\vec{a}+\vec{b}\right|^2 = 1+1+2\cos\theta = 4\cos^2\theta/2$

and $\left|\vec{a}-\vec{b}\right|^2 = 1+1-2\cos\theta = 4\sin^2\theta/2$

$\therefore \quad \frac{1}{\left|\vec{a}+\vec{b}\right|} + \frac{1}{\left|\vec{a}-\vec{b}\right|} = \frac{1}{4}\left(\operatorname{cosec}^2\theta/2 + \sec^2\theta/2\right)$

$= \frac{1}{4}\left(2+\tan^2\theta/2+\cot^2\theta/2\right) \ge 1 \{\text{using AM} \ge \text{GM}\}$

84. $\int e^{x^2+x}\left(4x^3+4x^2+5x+1\right)dx$

$= \int e^{x^2+x}\left(\left(2x+1\right)\left(2x^2+x\right)+\left(4x+1\right)\right)dx$

$= \int d\left(e^{x^2+x}\right)\left(2x^2+x\right)dx + \int\left(4x+1\right)\left(e^{x^2+x}\right)dx$

$= \left(2x^2+x\right).e^{x^2+x} - \quad \int\left(4x+1\right)e^{x^2+x}dx + \int\left(4x+1\right)e^{\left(x^2+x\right)}dx$

$= \left(2x^2+x\right)e^{x^2+x}+c \;\; f\left(x\right) = 2x^2+x \Rightarrow f^{|}\left(1\right) = 4\left(1\right)+1 = 5$

85. Let $\omega_i\left(i=1,2,3,4,5\right)$ denotes 1, 2, 3, 4, 5 white in bag

$P\left(\omega/\omega_i\right) = \frac{i}{5},\left(i=1,2,3,4,5\right) \quad P\left(\omega_i\right) = \frac{1}{5},\left(i=1,2,3,4,5\right)$

Now, $P\left(\omega/\omega_5\right) = \frac{P\left(\omega_5\right).P\left(\omega/\omega_5\right)}{\sum_{i=1}^{5} P\left(\omega_i\right)P\left(\omega/\omega_i\right)}$

$= \frac{\frac{1}{5}*1}{\frac{1}{5}\left(\frac{1}{5}+\frac{2}{5}+\frac{3}{5}+\frac{4}{5}+\frac{5}{5}\right)} = \frac{1}{3}$

86. Let $A = \left(x-1\right)\left(x^2-2\right).......\left(x^{20}-20\right)$

$= x.x^2.x^3.......x^{20}\left(1-\frac{1}{x}\right)\left(1-\frac{2}{x^2}\right).....\left(1-\frac{20}{x^{20}}\right)$

$\therefore A = x^{210}\left(1-\frac{1}{x}\right)\left(1-\frac{2}{x^2}\right)......\left(1-\frac{20}{x^{20}}\right)$

$\therefore$ Coefficient of x^{210} in A is 1.

87. $\{\alpha,\beta\} = \{\alpha^2,\beta^2\} \quad \Rightarrow \{\alpha,\beta\} = (0,0)(1,0)(1,1)\left(\omega,\omega^2\right)$

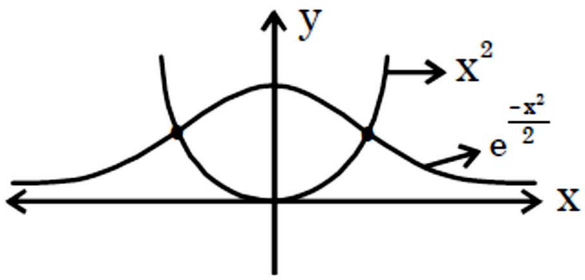
$b = 0, 1, 2 -1$

88. For least area, $\lambda = 0$ $\therefore A_{min} = 2\int_0^4 \left(12 - \left(x^2 - 4\right)\right) dx = \frac{256}{3}$

$\therefore \alpha + 3\beta = 265 \Rightarrow 6$

89. $f(x) = \lim_{m\to\infty}\left(\cos\frac{x}{m}\right)^{m^2} = e^{\lim_{m\to\infty} -\frac{2\sin^2\left(\frac{x}{2m}\right)}{\left(\frac{x}{2m}\right)^2}\cdot\frac{x^2}{m}\cdot m^2}$

$f(x) = e^{-\frac{x^2}{2}}$



$\therefore$ No. of solutions are 2.

90. a = 1, a + d = $\log_y x$, a + 2d = $\log_z y$

a + 3d = –15 $\log_x z$

$\therefore$ (1 + d) (1 + 2d) (1 + 3d) = –15

$\Rightarrow 6d^3 + 11d^2 + 6d + 16 = 0 \Rightarrow \boxed{d = -2}$

$S_{25} = \frac{25}{2}\left[2(1) + (24)(-2)\right] = 25(1 - 24) = -575$