Hints and Solutions

MATHEMATICS

1. $f(x) = f(2x + 1)$

$\Rightarrow x^2 - 3x + 4 = (2x + 1)^2 - 3(2x + 1) + 4$

$\Rightarrow x = -1, 2/3$

2. Different elments in Domain have different

f- images and codomain = Range

$\therefore$ f is a bijestion.

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

$\sum_{k=1}^{n} f(4+k) = 480$

$\Rightarrow n = 4$

4. $P(A) + P(B) + P(C) = 1$

$P(A) + \frac{3}{2} P(A) + \frac{1}{2} P(A) = 1$

$\Rightarrow P(A) = \frac{1}{3}$

5. $\frac{7}{7} \times \frac{6}{7} \times \frac{5}{7} = \frac{30}{49}$

6. $\frac{\frac{2}{5}}{\frac{2}{5} + \frac{1}{6}} = \frac{12}{17}$

7. Take n = 1, G.E. = 6

$\frac{n(n+1)(n+2)(n+3)}{4} = 6$

8. $\frac{x}{(x-a)(x-b)} = \frac{1}{(b-a)}\left(1-\frac{x}{a}\right)^{-1} + \frac{b}{a-b}\left(1-\frac{x}{b}\right)^{-1}$

x^n coefficient

$= \frac{a^n - b^n}{a-b} \cdot \frac{1}{a^n . b^n}$

9. $(1 - 2x)\, e^{-x}$

$$= (1-2x)\left[1-\frac{x}{1!}+\frac{x^2}{2!}-.....+\frac{(-1)^n x^n}{n!}+....\right]$$

x^n co-efficient $= (-1)^n\left[\frac{1+2n}{n!}\right]$

10. $-\log(1-2/3) = \log_c 3$

11. Take $\theta = 0^0$

G.E. = 0

12. $A = B = C = 60^0$

G.E. $= -1 + 1 = 0$

13. $f\left(\frac{\pi}{n}+x\right) = f(x) = \frac{\pi}{n}$

14. $(\sin x - 1)(\sin x - 1/2) > 0$

$\Rightarrow \sin x < 1/2$

$\Rightarrow x \in \left[0, \frac{\pi}{6}\right) \cup \left[\frac{5\pi}{6}, \pi\right)$

15. G.E $= 2\tan^{-1}\frac{5}{6} + \tan^{-1}\frac{11}{60}$

$= \tan^{-1}\left(\frac{60}{11}\right) + \cot^{-1}\left(\frac{60}{11}\right) = \frac{\pi}{2}$

16. Put $x = \sin h\,\theta$

$y = \theta = \sinh^{-1} x$

$\Rightarrow x = \sinh y$

17. Take A = B = C

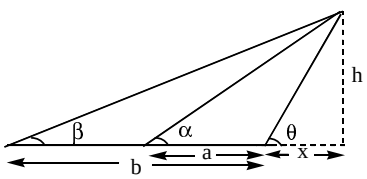
G . E = 0

18. G.E $= b^2(1-2\sin^2 A) - a^2(1-2\sin^2 B)$

$= b^2 - a^2$

19. $\tan\theta = \frac{h}{x}$

$\cot\alpha = \frac{a+x}{h}$



$\cot\beta = \frac{b+x}{h}$

$b\cot\alpha - a\cot\beta = \frac{x(b-a)}{h}$

$\tan\theta = \dfrac{b-a}{b\cot\alpha - a\cot\beta}$

20. **Neither I nor II**

21. **C(0, 0), radius = r**

A(x_1, y_1), B(x_2, y_2)

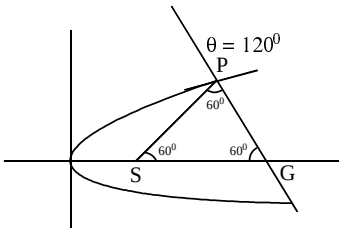
$x_1x_2 + y_1y_2 = r^2$ **$AB^2 = OA^2 + OB^2 - 2r^2$**

22. **d = C_1C_2 = $\sqrt{2}$, $r_1 = r_2 = \sqrt{2}$**

$\cos\theta = \dfrac{d^2 - r_1^2 - r_2^2}{2r_1r_2} = \dfrac{-1}{2}$

$\theta = 120^0$

23. **P = (at^2, 2at)**

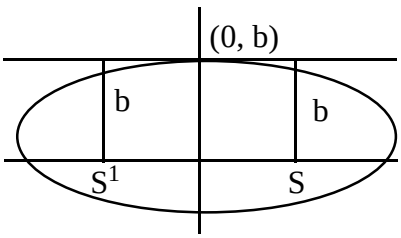


normal slope = – t = tan120^0

$\Rightarrow t = \sqrt{3}$

SP = a + at^2 = 4a

24.



Ans = b^2

25. $\dfrac{dy}{dx} = \dfrac{-y}{x}$

Normal slope = $\dfrac{x}{y} = t^2 = \dfrac{-p}{q} > 0$

$\Rightarrow \dfrac{p}{q} < 0$

$\Rightarrow$ **p > 0, q < 0**

26. $\frac{x^2}{6}-\frac{y^2}{8}=1$

$y=mx\pm\sqrt{a^2m^2-b^2}$

y = $\sqrt{3}x\pm\sqrt{10}$

27. **$x^2 + y^2 - 6x + 8y - 24 = 0$**

Ans = 7

28. **Hints :** $\Sigma r_1 r_2 \sin(\theta_1-\theta_2)$

$$=\frac{3}{2}\left(\sqrt{2}\right)\sin\left(\frac{-5\pi}{4}\right)+\left(\sqrt{2}\right)\left(\frac{-3}{5}\right)\sin\left(\frac{3\pi}{4}\right)+\left(\frac{-3}{5}\right)\left(\frac{3}{2}\right)\sin\left(\frac{\pi}{2}\right)$$

$=\left(\frac{-3}{2}\right)\left(\frac{-1}{\sqrt{2}}\right)-3\frac{\sqrt{2}}{5}\left(\frac{1}{\sqrt{2}}\right)-\frac{9}{10}\quad=\frac{3}{2}-\frac{3}{5}-\frac{9}{10}=0$ **R is true**

29. **Hints :** $x+iy=a^3-ib^3+3a^2ib-3ab^2$

$x=a^3-3ab^2=a\left(a^2-3b^2\right)\quad y=3a^2b-b^3=b\left(3a^2-b^2\right)$

$\frac{x}{a}+\frac{y}{b}=4\left(a^2-b^2\right)$

30. **Hints : Let** $z_1=a_1+ib, z_2=a_2+ib_2\quad |z_1+z_2|=|z_1+z_2|$

$\Rightarrow a_1b_2-a_2b_1=0\quad\Rightarrow\frac{b_1}{a_1}=\frac{b_2}{a_2}$

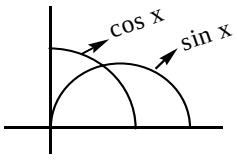
$Tan^{-1}\frac{b_1}{a_1}=\tan^{-1}\frac{b_2}{a_2}\quad Argz_1-Argz_2=0$

31. $\frac{\left(1+i\sqrt{3}\right)^{12}+\left(1-i\sqrt{3}\right)^{12}}{4^6}$

$$=\frac{2^{12}\left[\left(cis\frac{\pi}{3}\right)^{12}+\left(cis\left(-\frac{\pi}{3}\right)\right)^{12}\right]}{2^{12}}$$

$=2\cos 4\pi=2$

32. **Hints : I)** $\sin x=\cos x$



$x=\pi/4$

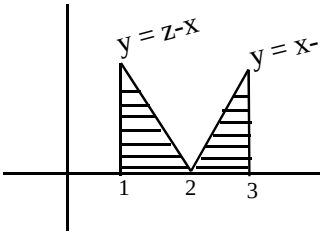
$R-A=\int_0^{\pi/4}(\cos x-\sin)\alpha x-\sqrt{2}-1$ **squnits**

II) y = cosx , y = x+ 1

$$R.A = \int_0^{\pi/2} \cos dx + \frac{1}{2}x|x|$$

$$= 1 + \frac{1}{2} = \frac{3}{2} \text{ squnits}$$

33. Hints : $y = |x-2|$ of x = 1, 3



$$R.A = 2\left(\frac{1}{2}x|x|\right)$$

=1 sq.units

34. Hints : $ydx - xdy + y^2xdx = 0$

$$\frac{ydx - xdy}{y^2} + xdx = 0$$

$$\int \frac{d}{dx}\left(\frac{x}{y}\right) + \int xdx = 0$$

$$\frac{x}{y} + \frac{x^2}{2} = c \Rightarrow \boxed{c = 1}$$

$$\frac{x}{y} = 1 - \frac{x^2}{2} = \frac{2 - x^2}{2} \Rightarrow y = \frac{2x}{2 - x^2}$$

35. Hints : $x^2 = 4y$ p(2m, m²) F of the tongent is

x(2m) –2(y+m²) = 0

m² – mx + y = 0 —— (1)

clearly order – 1, degree - 2

36. Hint : put y = vx

$$v + x\frac{d^2}{dx} = \frac{1+v^2}{v} \qquad vdv = \frac{1}{x}dx \Rightarrow \int v\alpha v = \int \frac{1}{x}dx$$

$$\frac{v^2}{2} = \log x + \log c \qquad \frac{y^2}{2x^2} = \log_e(xc)$$

$$xc = e^{\frac{y^2}{2x^2}}$$

37. Hint: $\bar{r} = \left(3\bar{i} + \bar{j} - \bar{k}\right) + t\left(x\bar{i} - \bar{j} + 2\bar{k}\right) AP = 15$

$$\left|t\left(2i - j - 2\bar{k}\right)\right| = 15 \text{ , } t = \pm 5$$

$\bar{r} = \overline{OP} = 13\bar{i} - 4\bar{j} + 9\bar{k}$

38. **Hint:** $\bar{r}.\left(5\bar{i} + 2\bar{j} - 7\bar{k}\right) + 9 = 0$

5x + 2y - 7z+9=0 A(1,-1,3), B (3, 3, 3)

$$-\frac{\pi_{111}}{\pi_{222}} = -\frac{[5-2-21+9]}{15+6-21+9} = \frac{9}{9} = 1 > o$$

opposite side of the plane

39. **hint:** $\bar{a} = \bar{i} + 2\bar{j} + 3\bar{i}$, $\bar{b} = 3\bar{i} + 3\bar{j} + \bar{k}$

$$\bar{a} \times \bar{b} = 7\bar{i} + 8\bar{j} - 3\bar{k} \qquad \cos\left(\bar{a} \times \bar{b}, \bar{j}\right) = \frac{\left(\bar{a} \times \bar{b}\right)\bar{j}}{\left|\bar{a} \times \bar{b}\right|\left|\bar{j}\right|} = \frac{8}{\sqrt{122}}$$

40. **Hint :** $\bar{b} \times \bar{c} = -3\bar{i} - \bar{j} + 2\bar{k}$ $\quad \bar{a} = 3\bar{i} + 2\bar{j} + \bar{k}$

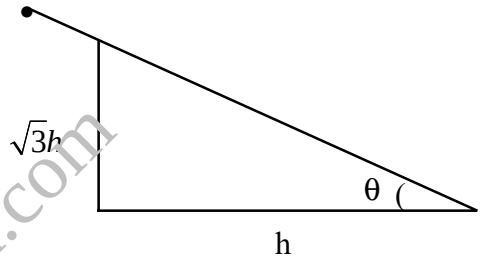
$$\cos\left(90^0 - \theta\right) = \frac{1-9-2+2}{\sqrt{14}\sqrt{14}} \qquad \sin\theta = \frac{9}{14}$$

41. **Hint:** $d_1 = \left|x_2 - x_1\right|, d_2 = \left|y_2 - y_1\right|, d_3 = \left|z_2 - z_1\right|$

$$d^2 = \left|x_2 - x_1\right|^2 + \left|y_2 - y_1\right|^2 + \left|z_2 - z_1\right|^2$$

$$d^2 = d_1^2 + d_2^2 + d_3^2$$

42. **Hint :**



$$\frac{1}{2}ab = 12 \Rightarrow ab = 24 \qquad \frac{1}{2}bc = 9 \Rightarrow bc = 18$$

$$\frac{1}{2}ac = 6 \Rightarrow ac = 12 \qquad \textbf{a = 4, b = 6, c = 3}$$

Eq of plane is $\frac{x}{4} + \frac{y}{6} + \frac{z}{3} = 1$

43. **Hint: A(2, –3, 1) , B (4, 2, – 5)**
(x –2) (x–4) + (y+3) (y–2) + (z–1) (z+5) = 0
$x^2 + y^2 + z^2 - 6x + y + 4z - 3 = 0$

44. **Hint: u = y logx + x log y**

$$u_x = \frac{y}{x} + \log_y$$

$$u_y = \log x \frac{x}{y}$$

$u_x u_y - u_x$ logx – u_y log y + log x logy = 1

45. **Hint :**

$$20^{3-2x^2} = \left(20^{\frac{3}{2}}\right)^{\left(3x^2-2\right)} \qquad 3 - 2x^2 = \frac{9x^2}{2} - 3$$

$$6 = \frac{13x^2}{2} \Rightarrow x = \pm\sqrt{\frac{12}{13}}$$

46. **Hint :**

$x > 0, \quad x^2 + x - 6 = 0$ **(x+3) (x–20 = 0 x =2, –3**

$x < 0$, $x^2 - x - 6 = 0$ (x – 3) (x + 2) = 0 x = 3, – 2

real with sum zero

47. **Hint : f(x) = $3x^3 - 22x^2 + 48x - 32 = 0$ verify (2) option**

$S_1 = 4 + 2 + \frac{4}{3} = \frac{22}{3}$ $S_3 = 4 \times 2 \times \frac{4}{3} = \frac{32}{3}$

48. **Hint : x = h + 1 h = (x – 1)**

f(h) = f(x– 1) = 0

$(x - 1)^3 - 5(x-1)^2 + 6(x - 1) - 3 = 0$

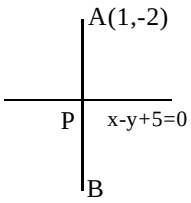
$x^3 - 8x^2 + 19x - 15 = 0$

49. **Hint : Let** $x = \cot\theta + \cos\theta$ $y = \cot\theta - \cos\theta$

$x^2 - y^2 = 4\cot\theta\cos\theta$ $x^2 - y^2 = 4\cot\theta\cos\theta$

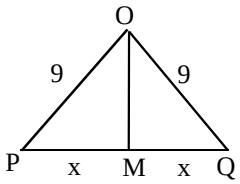
$\left(x^2 - y^2\right)^2 = 16\cot^2\theta\cos^2\theta$ **= 16xy**

50. **Hint : AM = 2 x AP**



$2\frac{|1+2+5|}{\sqrt{2}} = 8\sqrt{2}$

51. **Hint ;** $OM = \frac{15}{\sqrt{9+16}} = 3$



ΔOPM **, 81 = 9+x²**

$x^2 = 72 \Rightarrow \boxed{x = 6\sqrt{2}}$

Area = $\frac{1}{2} \times (2x) \times 3 = 18\sqrt{2}$

52. **Hint : a = 4, 2h = – 24, b = 11**

$|m_1 - m_2| = \frac{2\sqrt{h^2 - ab}}{|b|}$ $= \frac{2\sqrt{144 - 44}}{11} = \frac{20}{11}$

53. **Hint : m_1 = 7, m_2 = – 1**

ut third side slope m

$\frac{m-7}{1+7m} = \pm\left(\frac{m+1}{1-m}\right)$

$(3m-1)(m+3) = 0$

$m = -3, \frac{1}{3}$

54. **Hint:** $A=\begin{vmatrix}\cos x & \sin x & 0\\ -\sin x & \cos x & 0\\ 0 & 0 & 1\end{vmatrix}$ **= f(x)**

$A^{-1}=\left(f\left(x\right)\right)^{-1}=f\left(-x\right)$

55. $AA^T=A^T.A=I$

$\boxed{A^{-1}=A^T}$

56. $\begin{bmatrix}1 & 1 & -1\\ 2 & -1 & -c\\ -b & 3b & -c\end{bmatrix}\sim\begin{bmatrix}1 & 1 & -1\\ 0 & -3 & -c+2\\ 0 & 0 & -3c+5b-4bc\end{bmatrix}$

- 3c + 5b - 4bc = 0

$c=\frac{5b}{3+4b}<1$

$\left(4b+3\right)\left(b-3\right)<0$

$b\in\left(\frac{-3}{4},3\right)$

57. $\underset{x\to0}{Lt}\frac{1-\cos x}{x^2}.\frac{\sin 5x}{\sin 3x}=\frac{1}{2}\left(\frac{5}{3}\right)=\frac{5}{6}$

58. $f\left(0\right)=\underset{x\to0}{Lt}\frac{e^{kx}-1}{x}.\frac{\sin kx}{4x}$

$9=k.\frac{k}{4}\Rightarrow k^2=36$

$k\pm6$

59. $\tan y=\frac{2t}{1-t^2}$ $\qquad$ $\sin x=\frac{2t}{1+t^2}$

put t = $\tan\theta$

$\tan y=\tan 2\theta$ $\qquad$ $\sin x=\sin 2\theta$

$y=2\theta$ $\qquad$ $x=2\theta$

$\Rightarrow\frac{dy}{dx}=1$

60. $y=\sin^2 x^0=\sin^2\frac{\pi}{180}x$

$\frac{dy}{dx}=2\sin\frac{\pi}{180}x\cos\frac{\pi}{180}x.\frac{\pi}{180}$

$=\frac{\pi}{180}\sin 2x^0$

61. I : $y=\cot^{-1}\left(\cot x\right)=x$

$\frac{dy}{dx}=1$

II $: h(x) = f(g(x)) = e^{\sin^{-1}x}$

$$\frac{h^1(x)}{h(x)} = \frac{e^{\sin^{-1}x}\frac{1}{\sqrt{1-x^2}}}{e^{\sin^{-1}x}} = \frac{1}{\sqrt{1-x^2}}$$

62. $y = x^2 + x - 1 \quad (x_1 y_1) = (1,1)$

$$\frac{dy}{dx} = 2x+1 \Rightarrow m = \left(\frac{dy}{dx}\right)_{(1,1)} = 3$$

$$L.T = A = \left|\frac{y_1\sqrt{1+m^2}}{m}\right| = \frac{\sqrt{10}}{3}$$

$\Rightarrow n = 5$

$$L.N = C = \left|y_1\sqrt{1+m^2}\right| = \sqrt{10}$$

$$L.S.N = D = |y_1 m| = 3$$

B, A, D, C

63. $x + y = 20 \Rightarrow y = 20 - x$

$f(x) = x(20-x)^3$

$f^1(x) = 0 \Rightarrow x = 5$

$x, y = 5, 15$

64. by verification $\left(\frac{-1}{2}, \frac{5}{4}\right)$

65. ${}^{n+r-1}C_{r-1} = {}^8C_4 = 70$

66. ${}^{2n}C_3 : {}^nC_2 = 12:1$

$2n - 1 = 9$

$\Rightarrow n = 5$

67. $\frac{ACHINS}{SACHIN}$

$= 5 \times 5! + 1 = 601$

68. $\Delta = 0$

$\lambda(9)3 + 2(6)(2)(3) - \lambda(36) - 9(4) - 3(9) = 0$

$\lambda = 1$

69. $T_{r+1} = \frac{\frac{7}{2}\left(\frac{7}{2}-1\right)\left(\frac{7}{2}-2\right)\left(\frac{7}{3}-3\right).....}{r!}x^r$

$I^{st} - ve \ term \ is \ T_5$

70. I $: -L_{11} : L_{22}$

II $: \frac{nx}{x_1} + \frac{my}{y_1} = m + n$

71. Ais false, R is true

72. $np=\frac{15}{4}, npq=\frac{15}{16}$

$q=\frac{1}{4}, p=\frac{3}{4}$

$n\left(\frac{3}{4}\right)=\frac{15^{5}}{4}\Rightarrow n=5$

73. $\sum p\left(x=x_i\right)=1$

$C+\frac{2C}{3}+\frac{3C}{3^2}+\ldots\ldots\ldots=1$ $\qquad C\left(1+\frac{2}{3}+\frac{3}{3^2}+\ldots..\right)=1$

series is in A.G.P

$C\left(\frac{9}{4}\right)=1\Rightarrow C=\frac{4}{9}$

74. $y_1=\frac{e^{\sqrt{x}}-e^{-\sqrt{x}}}{2\sqrt{x}}\Rightarrow 2\sqrt{x}y_1=e^{\sqrt{x}}-e^{-\sqrt{x}}$

$2\sqrt{x}y_2+y_1\frac{1}{\sqrt{x}}=\frac{e^{\sqrt{x}}+e^{-\sqrt{x}}}{2\sqrt{x}}=\frac{y}{2\sqrt{x}}$

$4xy_2+2y_1=y\Rightarrow xy_2+\frac{y_1}{2}=y/4$

75. $\int\frac{3\cos x+2\sin x}{5\cos x+4\sin x}dx$

$=\frac{15+8}{25+16}x+\frac{12-10}{25+16}\log\left|5\cos x+4\sin x\right|+c$

$=\frac{23}{41}x+\frac{2}{41}\log\left|5\cos x+4\sin x\right|+c$

76. $t=\log x$

$dt=\frac{1}{x}dx$

$\Rightarrow x=e^t$

$\int e^t\left(\sin t+\cos t\right)dt=e^t\sin t+c$

$=x\sin\left(\log x\right)+c$

77. $\int\sec x\left(\sec x+\tan x\right)^{-5}dx$

$=\frac{\left(\sec x+\tan x\right)^{-5}}{-5}+c$

78. $\int_0^{\pi/2}\frac{1}{2^2\cos^2 x+3^2\sin^2 x}dx=\frac{\pi}{2(2)(3)}=\frac{\pi}{12}$

79. $I_1 = \int_0^{\pi/2} f(\sin 2x)\sin x\,dx$

$= \int_0^{\pi/2} f(\sin 2x)\cos x\,dx = I_2$

$\frac{I_1}{I_2} = 1$

80. $A = \cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$

$B = \sin^2\alpha + \sin^2\beta + \sin^2\gamma + \sin^2\delta = \frac{8}{3}$

$c = \frac{1+\cos 2\alpha}{2} + \frac{1+\cos 2\beta}{2} + \frac{1+\cos 2\gamma}{2} + \frac{1+\cos 2\delta}{2} = \frac{4}{3}$

$\cos 2\alpha + \cos 2\beta + \cos 2\gamma + \cos 2\delta = \frac{8}{3} - 4 = -\frac{4}{3}$

B, A, C

Physics

81. $T = 2\pi\sqrt{\frac{\ell}{g}} \Rightarrow g \propto \frac{\ell}{T^2}$

$\frac{\Delta g}{g} \times 100 = \frac{\Delta \ell}{\ell} \times 100 + 2\frac{\Delta T}{T} \times 100$

82. $V^1 = \frac{V_2 + V_3}{2} = ?$

$V_{avg} = \frac{2V_1 V^1}{V_1 + V^1}$

83. For regular time intervals $S_n \alpha (2n-1) \Rightarrow 1:3:5:7:9:$

$\Rightarrow 25x \Rightarrow 20 \Rightarrow x = 0.8$

$h_2 = 20 - 9x \Rightarrow 20 - 9 \times 0.8 = 12.8m$

$h_5 = 20 - 1x \Rightarrow 20 - 1 \times 0.8 = 19.2m$

84. $M(u - gt) = m_1 v_1 + m_2 v_2$

$1000[100 - 10x\ 5] = -400 \text{ x } 25 + 600\ V_2$

85. $\frac{PE}{KE} = \frac{x}{h-x} \Rightarrow PE = KE$

$x = \frac{h}{2} \therefore \left[\frac{PE}{KE}\right]^1 = \frac{x}{4h-x} \Rightarrow \frac{h/2}{4h - h/2}$

$\Rightarrow 1:7$

86. If $m_1 >> m_2 (m_2 = 0)$

$V_2 = \frac{2m_1}{m_1 + m_2} u_1 + \frac{m_2 - m_1}{m_1 + m_2} u_2$

$\Rightarrow 2u_1 - u_2 \Rightarrow 2 \times 4 - 1$

$\Rightarrow 7 ms^{-1}$

87. $x_2 = \frac{m_2 d}{m_1 + m_2} \Rightarrow \frac{r_2^3 (r_1 + r_2)}{r_1^3 + r_2^3}$

$\Rightarrow \frac{1^3 (2+1)}{2^3 + 1^3} \Rightarrow \frac{3}{9} \Rightarrow \frac{1}{3} = 0.33cm$

88. Theory bit

89. $I_1 W_1 = I_2 W_2$

$\frac{2}{5} MR_1^2 \frac{2\pi}{T1} \Rightarrow \frac{2}{5} MR_2^2 \frac{2\pi}{T2}$

$\frac{T_2}{T_1} = \left[\frac{R_2}{R_1}\right]^2 \Rightarrow \frac{1}{n^2} \Rightarrow T_2 = ?$

90. $\frac{KE_T}{KE_R}=\frac{\frac{1}{2}MV^2}{\frac{1}{2}MV^2\left(\frac{K^2}{R^2}\right)}\Rightarrow\frac{1}{\left(K^2/R^2\right)}\Rightarrow\frac{1}{2/5}=\frac{5}{2}$

91. Theory bit

92. $T=2\pi\sqrt{\frac{M}{K}}\ ,T\alpha\sqrt{M}$

$T^1\alpha\sqrt{M+m}$

$\frac{T}{T_1}=\sqrt{\frac{M}{M+m}}\Rightarrow\frac{3}{5}=\sqrt{\frac{M}{M+m}}\Rightarrow\frac{m}{M}=?$

93. $Tan60^0\alpha\frac{1}{y_A},\ Tan30^0\alpha\frac{1}{y_B}$

$\frac{Tan60^0}{Tan30^0}=\frac{y_B}{y_A}\Rightarrow y_B=3y_A$

94. Fd=W=2TA

$F=\frac{2TA}{d}\Rightarrow\frac{2\times7\times10^{-2}\times10^{-2}}{5\times10^{-5}}$

95. $v=\frac{\pi pr^4}{8\eta\ell}\quad r_1=r,\ r_2=2r$

$r|^4=r_1^4+r_2^4\Rightarrow r_1^4\left[1+\left(\frac{r_2}{r_1}\right)^4\right]\Rightarrow r^4\left[1+\left(\frac{2}{1}\right)^4\right]$

96. $t=\frac{R_t-R_0}{R_{100}-R_0}\times100$

97. Theory bit

98. dQ = du + dw
30 = du – 10

99. $\eta=1-\frac{T_2}{T_1}$

$\eta_B>\eta_A$

100. $Q=mL=a^3\rho L$

$Q=\frac{KA\Delta\theta t}{\ell}$

$a_3\rho L=\frac{K\left(6a^2\right)\Delta\theta t}{\ell}$

$t=\frac{9\rho L\ell}{K6\Delta\theta}=\frac{10\times0.9\times80\times0.2}{0.02\times6\times100}$

101. $\frac{2\pi}{\lambda} = \frac{\pi}{3}$

$\therefore \frac{\lambda}{2} = 3\text{cm}$

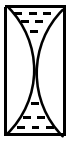
102. Second resonating length = $3\ell_1$

$= 3 \times 24.7$

$= 74.1m$

103. $\mu = \frac{\sin i}{\sin r}$

$x = \frac{t \sin(i-r)}{\cos r}$

104. 

$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$

$= (\mu_g - 1)\frac{1}{R} - (\mu_w - 1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right) + (\mu_g - 1)\frac{1}{R_2}$

find F

105. $I = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos\phi$

106. $\sqrt{d^2 + l^2} = 10 \times 10^{-2}$

$d^2 + l^2 = 10^{-2}$

$\therefore B = \frac{\mu_o}{4\pi} \frac{M}{(d^2 + l^2)^{\frac{3}{2}}}$

Chemistry

121. **The order of first electron affinity of VIA group elements is S > Se > Te > O**

122. $HOH_2C-(CHOH)_4-CHO \xrightarrow[HNO_3]{conc} HOOC-(CHOH)_4-COOH$

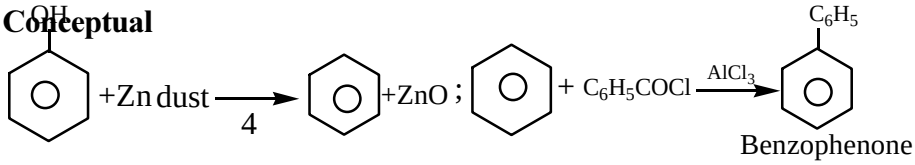
glucose **glucose saccharic acid**

123. $C_2H_6(1.54A^0); C_6H_6(1.39A^0); C_2H_4(1.34A^0), C_2H_2(1.20A^0)$

124. **Lesser the Gold number greater is the protective nature**

125. **Conceptual**

126. **Conceptual**

127. 

128. $Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + H_2O + CO_2$

106gr Na_2CO_3 **= 22.4 lt CO_2**

3.18gr Na_2CO_3 **= ?** $\frac{22.4}{106} \times 3.18 = 0.672 lit$

129. **$N_3H(-1/3); NH_2OH(-1); H_2NNH_2(-2); NH_3(-3)$**

130. **Average kinetic energy depends on temprature and is independent on the nature of gas**

131. $t_{99.9\%} = t_{99\%} \times \frac{3}{2}$

132. **Conceptual**

133. **Conceptual**

134. $3Mg + N_2 \Rightarrow Mg_3N_2$

135. **Bleacing powder, lime and Alum are added in the same sequence in Nalgonda Technique for defluridation of water**

136. **Conceptual**

$CH_3COCl > (CH_3CO)_2O > CH_3COOC_2H_5$

137. **Polytetrafluoro ethylene is called 'Teflon'**

138. **Conceptual**

139. $\mu = \sqrt{n(n+2)} B.M$ **where n=no of unpaired electrons**

140. Conceptual

141. SO_2 bleaches by reduction $SO_2 + 2H_2O \rightarrow H_2SO_4 + 2(H)$

$2(H) + \text{coloured organic matter} \rightarrow \text{Colourless organic matter}$

142. $A = C_2H_5\text{-}N\begin{matrix}=O\\ \searrow O\end{matrix}$ **. So C-O is absent**

143. $E_{Cell} = E^0_{Cathode} - E^0_{anode}$

$= 0.33 - (-2.38)$

$= 0.33 + 2.38$

=2.71V

144. % of 'P' character in sp^3d **hybrid orbitals is 60% (or)** $\frac{3}{5}$ **fraction**

145. Conceptual

146. Among alkali metal carbonates Li_2CO_3 only decomposes

147. $CaSO_4\frac{1}{2}H_2O + \frac{3}{2}H_2O \rightarrow CaSO_4.2H_2O$ **i.e., hydration**

148. $X(\text{corners}) = 8\times\frac{1}{8} = 1$ $Y(\text{face center}) = 6\times\frac{1}{2} = 3$ Formula of the compound = XY_3

149. $\%\text{ of } C = \frac{12}{44}\times\frac{\text{Wt of } CO_2 \text{ Formed}}{\text{Wt of organic compound}}\times 100 = \frac{12}{44}\times\frac{0.44}{0.16}\times 100$ **=75%**

$\%\text{ of } H_2 = \frac{2}{18}\times\frac{\text{Wt of } H_2O}{\text{Wt of organic compound}}\times 100 = \frac{2}{18}\times\frac{0.36}{0.16}\times 100 = 25\%$

150. Conceptual

151. $\frac{P^0 - P^S}{P^0} = \frac{m}{m+55.5}$; $\frac{2}{100} = \frac{m}{m+55.5}$ m= 1.13m

152. $FeCl_3 \rightarrow Fe^{3+} + 3Cl^-$; **Boiling point $\propto$ elevationof b.p $\propto$ no of particles**

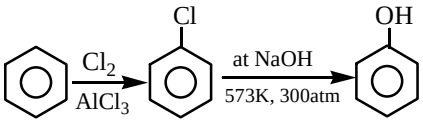
153. Anion exchange resin can be revived by Na_2CO_3. $10H_2O$ aquous solution

154. NaOH is a strong base

155. $[H^+] = 10^{-7} + 10^{-8} = 1.1 \text{x } 10^{-7}$

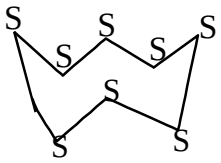
$P^H = -\log[H^+] = -\log 1.1\times 10^{-7} = 7 - \log 1.1 = 6.98$

156. B.P order is HCl< HBr < HI < HF So HCl in most volatile

157. 

Phenol B.P in more than ether because of intermolecular hydrogen bonding

158. Equilibrium state depends on conc, Temp, Pressure and Catalyst but Equilibrium constant depends on temperature

159. 

$\angle SSS = 105^0$; S-S bond length = $2.12A^0$; Each 'S' has 2 lone pairs

160. $CH_3COOHClCH_2COOH \xrightarrow{Cl_2/Red'P'} Cl_2CHCOOH \xrightarrow{Cl_2/Red'P'} CCl_3COOH$