TEST NO - 12

KEY SHEET

MATHEMATICS

1) 1	2) 3	3) 2	4) 4	5) 3	6) 1	7) 3	8) 2	9) 1	10) 1
11) 3	12) 3	13) 4	14) 1	15) 4	16) 1	17) 2	18) 4	19) 3	20) 2
21) 1	22) 3	23) 1	24) 3	25) 3	26) 3	27) 2	28) 1	29) 3	30) 1
31) 1	32) 3	33) 1	34) 2	35) 3					

CHEMISTRY

36) 2	37) 3	38) 3	39) 4	40) 2	41) 1	42) 4	43) 1	44) 2	45) 1
46) 4	47) 1	48) 3	49) 4	50) 1	51) 3	52) 1	53) 4	54) 2	55) 2
56) 2	57) 3	58) 4	59) 3	60) 4	61) 4	62) 1	63) 4	64) 4	65) 2
66) 3	67) 1	68) 3	69) 4	70) 1					

PHYSICS

71) 3	72) 3	73) 2	74) 3	75) 4	76) 3	77) 3	78) 3	79) 3	80) 2
81) 4	82) 3	83) 1	84) 4	85) 2	86) 4	87) 3	88) 3	89) 1	90) 2
91) 4	92) 3	93) 4	94) 2	95) 4	96) 2	97) 3	98) 3	99) 1	100) 4
101) 1	102) 3	103) 2	104) 3	105) 2					

MATHEMATICS

1. $S_{n+3}-3\left(S_{n+2}\right)+3S_{n+1}-S_n$

$=S_{n+3}-S_{n+2}-2\left(S_{n+2}-S_{n+1}\right)+S_{n+1}-S_n$

$=t_{n+3}-2\left(t_{n+2}\right)+t_{n+1}=0$

2. $6, x, y, z, 54$ are in G.P.

$\Rightarrow t_5 = 54 \Rightarrow 6r^4 = 54$

$\Rightarrow r^4 = 9 \Rightarrow r = \sqrt{3}$

$z = 6r^3 = 6\left(\sqrt{3}\right)^3 = 18\sqrt{3}$

3. $\left(666.....n \text{ digits}\right)^2 + \left(888.....n \text{ digits}\right)$

$= \left[\frac{6}{9}\left(10^n - 1\right)\right]^2 + \frac{8}{9}\left[10^n - 1\right]$

$= \frac{4}{9}\left[10^n - 1\right]\left[10^n - 1 + 2\right]$

$= \frac{4}{9}\left[10^{2n} - 1\right]$

4. $a_1, a_2, a_3.....a_n$ are in AP, let $a_1 = a$

$c.d = d$

$a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$

$6a + 69d = 225 \Rightarrow 2a + 23d = 75$

$a_1 + a_2 + a_3 + ... + a_{23} + a_{24} = \frac{24}{2}\left(2a + 23d\right)$

$= 12 \times 75 = 900$

5. Consider $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}$ are in H.P

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ are 4HMS between 1 and $\frac{1}{6}$

$\frac{H_1 + a}{H_1 - a} + \frac{H_4 + b}{H_4 - b} = \frac{\frac{1}{2} + 1}{\frac{1}{2} - 1} + \frac{\frac{1}{5} + \frac{1}{6}}{\frac{1}{5} - \frac{1}{6}}$

$-3 + 11 = 8 = 2 \times 4$

$\frac{H_1 + a}{H_1 - a} + \frac{H_n + b}{H_n - b} = 2n$

6. a, b, c are in A.P p, q, r are in H.P , ap, bq, cr are in G.P

$2b = a + c\ ;\ \frac{2}{q} = \frac{1}{p} + \frac{1}{r}$

$\Rightarrow b^2q^2 = apcr$

$\Rightarrow \left(\frac{a+c}{2}\right)^2 \frac{4\left(pr\right)^2}{\left(p+r\right)^2} = acpr$

$\Rightarrow \frac{\left(a+c\right)^2}{ac} = \frac{\left(p+r\right)^2}{pr}$

$\frac{a}{c} + \frac{c}{a} = \frac{p}{r} + \frac{r}{p}$

7. G. M between a and b is $\sqrt{ab}$

8. Sum of first n odd integers = n^2

$\therefore \left(\frac{p+1}{2}\right)^2 + \left(\frac{q+1}{2}\right)^2 = \left(\frac{r+1}{2}\right)^2$

$\therefore p+1 = 8, q+1 = 6, r+1 = 10$

9. Sum of interior angles of a polygon of n sides = $(n-2)\ 180^o$

10. $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + ... = \frac{\pi}{4}$

$\frac{2}{1.3} + \frac{2}{5.7} + \frac{2}{9.11} + ... = \frac{\pi}{4}$

11. $x = \frac{1}{1-a}, y = \frac{1}{1-b}, z = \frac{1}{1-c}$

a, b, c are in A.P

$\Rightarrow 1-a, 1-b, 1-c$ are in AP.

$\Rightarrow \frac{1}{1-a}, \frac{1}{1-b}, \frac{1}{1-c}$ are in H.P

x, y, z are in H.P

12. Infinite A.G.P. $S_\infty = \frac{a}{1-r} + \frac{dr}{(1-r)^2}$

13. Let a, b be two numbers

$H.M = \frac{2ab}{a+b}, G.M = \sqrt{ab}$

$\frac{2ab}{a+b} : \sqrt{ab} = 12:13$

$\Rightarrow \frac{2\sqrt{ab}}{a+b} = \frac{12}{13}$

$\Rightarrow \frac{a+b}{\sqrt{ab}} = \frac{13}{6}$

$\Rightarrow \sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = \frac{2}{3} + \frac{3}{2}$

$\Rightarrow \frac{a}{b} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$

$\therefore a:b = 4:9$

14. $\frac{2}{\cos x} = \frac{1}{\cos(x+y)} + \frac{1}{\cos(x-y)}$

15. We have, $2^x + 2^y = 2$

$\Rightarrow 2^y = 2 - 2^x \Rightarrow y = \frac{\log(2 - 2^x)}{\log 2}$

For y to be defined, $2 - 2^x > 0 \Rightarrow 2^x < 2$

Since, 2^x is an increasing function, therefore we get . $x < 1$

16. $f\left(x\right) = 4^x - 2^{x+1} + 5 = \left(2^x\right)^2 - 2.2^x + 5$

$= \left(2^x - 1\right)^2 + 4 \geq 4$

$\Rightarrow$ Range of $f\left(x\right)$ is $[4, \infty)$

17. We have $\left[\frac{1}{2} + \frac{x}{100}\right] = 0\ if\ \ 0 \leq x < 49$

$= 1\ if\ \ 50 \leq x \leq 99$

Thus

$\left[\frac{1}{2}\right]+\left[\frac{1}{2}+\frac{1}{100}\right]+\left[\frac{1}{2}+\frac{2}{100}\right]+...+\left[\frac{1}{2}+\frac{99}{100}\right]$

=50

18. We have,

$$f[f(x)]=\frac{\alpha f(x)}{f(x)+1}=\frac{\alpha\frac{\alpha x}{x+1}}{\frac{\alpha x}{x+1}+1}$$

$$=\frac{\alpha^2 x}{\alpha x+x+1}$$

$$\therefore x=\frac{\alpha^2 x}{(\alpha+1)x+1} \Rightarrow \alpha=-1$$

19. $f(x+y,x-y)=\frac{4xy}{4}=\frac{(x+y)^2-(x-y)^2}{4}$

$f(x,y)=\frac{x^2-y^2}{4}, f(y,x)=\frac{y^2-x^2}{4}$

$\Rightarrow$ AM of $f(x,y), f(y,x)$ is 0

20. $3f(x)+5f\left(\frac{1}{x}\right)=\frac{1}{x}-3----(1)$

$5f(x)+3f\left(\frac{1}{x}\right)=x-3----(2)$

$5(2)-3(1)\Rightarrow 16f(x)=5x-15-\frac{3}{x}+9$

$=-\frac{3}{x}+5x-6$

$f(x)=\frac{1}{16}\left[-\frac{3}{x}+5x-6\right]$

21. $f(x)=\log_{10}\left[1-\log_{10}\left(x^2-5x+16\right)\right]$

Domain of 'f' is

$1-\log_{10}\left(x^2-5x+16\right)>0$

$\Rightarrow \log_{10}\left(x^2-5x+16\right)<1$

$\Rightarrow \left(x^2-5x+16\right)<10$

$\Rightarrow x^2-5x+6<0$

$x\in(2,3)$

22. Different letters of the word

ACCOUNTANCY is $\begin{Bmatrix}\text{ACOUNTY}\\ \text{AC}\quad\text{N}\\ \text{C}\end{Bmatrix}$

'7'. Cardinality of A = 7.

23. $n(\mu)=60, n(A)=21, n(B)=43$

Greatest value of $n(A\cup B)=n(\mu)=60$

Least value of $n(A\cup B)=n(B)=43$

24. n(R)=20, n(P)=17

$n(R\cup P)=24$

$n(R\cap P)=20+17-24=13$

25. Substitute x =1, y = 2, z = 3 and a = 1, b = 2, in question and options

26. Let $n(A)=m, n(B)=n$

$n[P(A)]=2^m, n[P(B)]=2^n$

$n[P(A)]=n[P(B)]+15$

$\Rightarrow 2^m-2^n=15\Rightarrow m=4; n=0$

27. $R=\left\{(x,y)/2x^2+3y^2\le 6\right\}$ then

domain of f = values of x,

$\frac{x^2}{3}+\frac{y^2}{2}\le 1\Rightarrow x\in\left[-\sqrt{3},\sqrt{3}\right]$

28. Clearly, R is not a reflexive relation, because a line cannot be perpendicular to itself.

Let $l_1 R l_2$, $\Rightarrow l_1\perp l_2$

$\Rightarrow l_2\perp l_1$

$\Rightarrow l_2 R l_1$

$\therefore$ R is a symmetric relation.

R is not a transitive relation, because if $l_1\perp l_2$ and $l_2\perp l_3$, then l_1 may be parallel to l_3

29. We have, $xRy\Leftrightarrow x>y$

$\therefore R=\{(2,1),(3,1)\}$

Hence, Range of R = {1}

30. Conceptual questions

31. Conceptual questions

32. $f:R\to R \quad f(x)=x-[x]-\frac{1}{2}$

$\left\{x\in R/\ f(x)=\frac{1}{2}\right\}$

$\Rightarrow x-[x]-\frac{1}{2}=\frac{1}{2}$

$\Rightarrow x-[x]=1$ which is absured

34. $f(n)>2\Rightarrow n=3k+1$

$n=1\Rightarrow f(n)=10-1=9$

$n=4\Rightarrow f(n)=10-4=6$

$n=7\Rightarrow f(n)=10-7=3$

$\{n/\ f(n)>2\}=\{1,4,7\}$

35. $(fog)(\pi)+(gof)(e)$

$=f[g(\pi)]+g[f(e)]$

$=f(0)+g(1)$

$=0-1=-1$

CHEMISTRY

39. $\frac{V_1}{T_1}=\frac{V_2}{T_2}$

40. $V \propto \frac{1}{P}$

41. $\frac{P_1V_1}{T_1}=\frac{P_2V_2}{T_2}$

42. $\frac{r_1}{r_2}=\sqrt{\frac{M_2}{M_1}}$

43. NO

44. $P_1V_1=P_2V_2$

46. Central atom has 1 l.p and 3 bond pairs.

48. Antibonding M.O'S have two unpaired $e^{\square}$ s in O_2 .

56. $LiC\ell$ is more covalent and is soluble in covalent solvents. $KC\ell$ is soluble in solvents with higher dielectric constant.

60. with increase in number of lone pairs on bonded atoms B.E. decreases.

61. $PC\ell_5$ exists as $\left[PC\ell_4\right]^+$ and $\left[PC\ell_6\right]^-$ in solid state central 'P' shows sp^3 and sp^3d^2 in respective ions.

63. According VSEPR theory $C\ell F_5$ has square pyramidal structure.

70. bond length = $1.25\times10^{-8}cm$

$u=e\times d=4.8\times10^{-10}\times1.25\times10^{-8}$

$6\times10^{-18}=6debye$

Ionic character $=\frac{1.03}{6}\times100=17\%$.

PHYSICS

71. $y_1=\frac{u^2}{2g}Sin^2\theta$

$y_2=\frac{u^2}{2g}Cos^2\theta$

$y_1+y_2=\frac{u^2}{2g}$

72. Range of the bullet

$R=4\sqrt{\frac{2H}{g}}=50\sqrt{\frac{2\times20}{10}}=100$

R < x

The bullet does not strike the monkey.

73. $\frac{1}{2}at^2=ut \quad t=\sqrt{\frac{2h}{g}}$

$a=\frac{24}{t}=\frac{2\times20}{4}=10ms^{-2}$

74. $A: x_A=ut \quad y=\frac{1}{2}gt^2$

$B: x_B=-2ut$

w.r.t $x=3ut \quad y=\frac{1}{2}gt^2$

$y=\frac{gx^2}{9u^2}$

75. Conceptual

76. $\frac{2u_x.u_z}{g}=\frac{u_y^2}{2g}2$

$u_x=\frac{u_y}{2}$

$a=\frac{b}{2}$

78. $\frac{2uSin\theta}{g}=2$

$uSin\theta=g$

$\Delta u=2uSin\theta$

$2g=19.6ms^{-1}$

79. $t=\frac{u}{gSin\theta}=2$

$V=\sqrt{V_\lambda^2+y^2}=10ms^{-1}$

80. $h=\frac{u^2}{2g}$ H=$\frac{9u^2-u^2}{2g}=\frac{4u^2}{g}$

Total $d=2h+H$

$=\frac{2u^2}{2g}+\frac{4u^2}{g}$

$=\frac{10u^2}{2g}=\frac{5u^2}{g}$

81. $R=a+b \quad \theta=45^0 \quad u^2=(a+b)g$

$h=\frac{ab}{a+b}$

83. $\frac{1}{\sqrt{3}}=\frac{u\frac{\sqrt{3}}{2}-gt}{u\frac{1}{2}}$

$u\left(\frac{\sqrt{3}}{2}-\frac{1}{2\sqrt{3}}\right)=gt$

$t=\frac{u}{g\sqrt{3}}$

84. $R=\frac{2u^2Sin(\alpha-\beta)}{gCos^2\beta}\times\cos\alpha$

85. $t=\frac{\sqrt{u_1u_2}}{g}=\frac{2}{10}=0.2s$

87. $100=-40t+\frac{1}{2}10t^2$

$5t^2-4t-100=0$

$t^2-8t-20=0$

$(t-10)(t+2)=0\Rightarrow t=10s$

88. $h=\frac{1}{2}gt^2 \quad h+x=\frac{1}{2}gt_1^2$

$\frac{t_1}{t}=\left(1+\frac{x}{h}\right)^{1/2} \Rightarrow t_1=t\left[1+\frac{x}{2h}\right]$

$t_1-t=\frac{xt}{2h}$

89. $\frac{R_2}{R_1}=\frac{u_2}{u_1}\sqrt{\frac{h_2}{h_1}} \Rightarrow \frac{R_2}{d}=\frac{3V}{V}\sqrt{\frac{4h}{h}}$

$R_2=6d$

90. $\frac{1}{2}gt^2-\frac{1}{2}g\left(t-T\right)^2=L$

$\frac{1}{2}gt^2-\frac{1}{2}gt^2+gtT\frac{1}{2}gT^2=L$

$gtT=L+\frac{1}{2}gT^2$

$t=\frac{L}{gT}+\frac{T}{2}$

91. $9V^2-V^2=4gy$

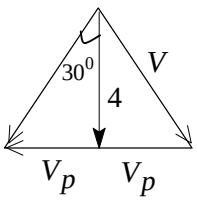
$V^2=\frac{4gy}{8}$

$u^2-v^2=2gy$

$u^2=\frac{5gy}{2}$

$h=\frac{u^2}{2g}=\frac{5y}{4}$

92.



$\frac{V_P}{4}=Tan30^0$

$V_P=4/\sqrt{3}$

93. $a=\frac{2\left(V_2-V_1\right)}{t_1+t_2}$

94. $\frac{2rSin\left(\frac{\theta}{2}\right)}{r\theta}=\frac{2Sin45^0}{\frac{\pi}{2}}$

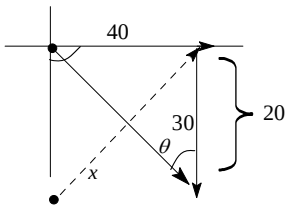
$2\sqrt{2}:\pi\frac{22}{5}$

$7\sqrt{2}:11$

95. $\vartheta=-b+2ct$

At t = 0 $\vartheta=-b$

98.



$Sin\ \theta = 4/5$

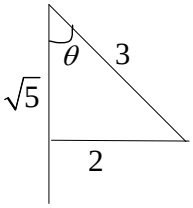
$x=20\times\frac{4}{5}=16km$

99. $v_1=5\hat{i}+5\hat{j} \qquad \theta_1=45^0$

$v_2=2\sqrt{3}\hat{i}+2\hat{j} \qquad \theta_1=30^0$

$\alpha=15^0$

100.



$F=mgTan\theta$

$=10\times10\times\frac{2}{\sqrt{5}}=40\sqrt{5}N$

101. $F_1+F_2=170, F_1-F_2=170$

$F_1=120\ F_2=50$

$F=\sqrt{120^2+50^2}=130N$

102. $10\times8\times Cos\theta=40\sqrt{3}$

$Cos\theta=\sqrt{3}/2$

$x=10\times8\times\frac{1}{2}=40$

103. $P\hat{i}+\left(-\frac{2P}{2}\hat{i}+2P\frac{\sqrt{3}}{2}\hat{j}\right)+\left(-\frac{3P}{2}\hat{i}-3P\frac{\sqrt{3}}{2}\hat{j}\right)$

$P\hat{i}-P\hat{i}+P\sqrt{3}\hat{j}-\frac{3P}{2}\hat{i}-3P\frac{\sqrt{3}}{2}\hat{j}-\frac{3P}{2}\hat{i}-\frac{P\sqrt{3}}{2}\hat{j}$

$F=\sqrt{\frac{9P^2}{4}+\frac{3P^2}{4}}=P\sqrt{3}$

104. $\frac{S_1}{S_2}=\frac{u_1^2}{u^2}$

$\frac{h}{2}=\frac{10.0}{u^2}$

$u^2=200$

$h=\frac{200}{20}=10m$