JUNIOR INTERMEDIATE

IMPORTANT QUESTIONS

MATHEMATICS

PHYSICS

CHEMISTRY

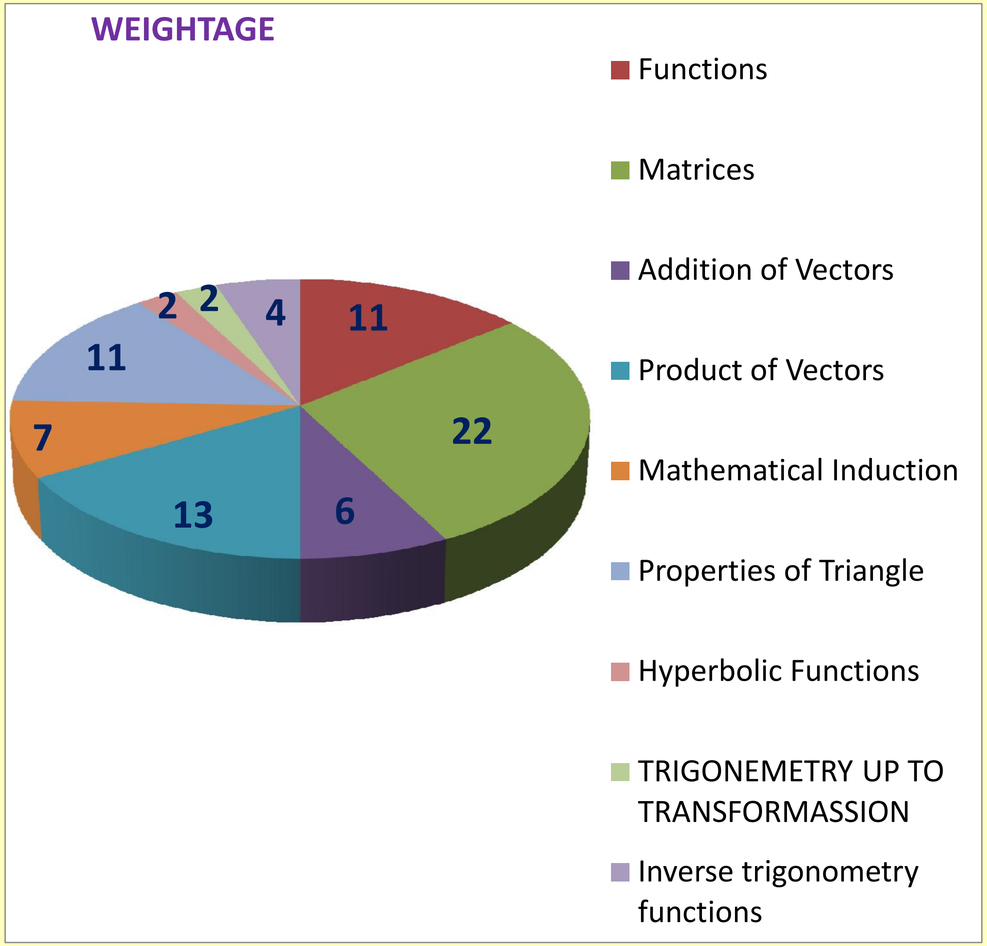
MATHS - 1A TOPIC WISE WEIGHTAGE

How to Score Minimum 70 Marks by Every Student

S.NO	CHAPTER NAME	EASY / MODERATE	NO OF QUESTIONS			WEIGHTAGE
			LAQ's	SAQ's	VSAQ's	
1	Functions	Moderate	8	-	20	**11**
2	Matrices	Easy	12	10	20	**22**
3	Addition of Vectors	Easy	-	10	15	**6**
4	Product of Vectors	Easy	10	10	15	**13**
5	Mathematical Induction	Moderate	10	-	-	**7**
6	Properties of Triangle	Moderate	10	10	-	**11**
7	Hyperbolic Functions	Easy	-	-	10	**2**
8	TRIGONEMETRY UP TO TRANSFORMASSION	Moderate	-	-	20	**2**
9	Inverse trigonometry functions	Easy	-	10	-	**4**
	TOTAL		50	50	100	**78**

Number of Questions Covered

	Minimum		Maximum	
	Questions	Marks	Questions	Marks
LAQ's	4	28	5	35
SAQ's	4	16	5	20
VSAQ's	6	12	8	16
Total	**14**	**56**	**18**	**71**



MATHS-1A

LAQ's (7 MARKS QUESTIONS)

FUNCTIONS

1. Let $f: A \to B, g: B \to C$ be bijections. Then show that gof: $A \to C$ is a bijection.

2. Let $f: A \to B, g: B \to C$ be bijections. Then show that $(gof)^{-1} = f^{-1}og^{-1}$.

3. Let $f: A \to B$, I_A and I_B be identity functions on A and B respectively. Then show that $fOI_A = f = I_Bof$.

4. Let $f: A \to B$ be a bijection. Then show that $fof^{-1} = I_B$ and $f^{-1}of = I_A$.

5. Let $f: A \to B$ be a bijection. Then show that 'f' is a bijection if and only if there exists a functions $g: B \to A$ such that $fog = I_B$ and $gof = I_A$ and in this case, $g = f^{-1}$.

6. Let $f: A \to B$, $g: B \to C$ and $h: C \to D$. Then show that ho(gof) = (hog)of, that is composition of functions is associative.

7. i) Let $A = \{1,2,3\}$, $B = \{a,b,c\}$, $C = \{p,q,r\}$. If $f: A \to B$, $g: B \to C$ are defined by $f = \{(1, a), (2, c), (3, b)\}$, $g = \{(a, q), (b, r), (c, p)\}$ then show that $f^{-1}og^{-1} = (gof)^{-1}$.

   ii) If $f: A \to B, g: B \to A$ & $f = \{(1,a),(2,c),(4,d),(3,b)\}, g^{-1} = \{(2,a),(4,b),(1,c),(3,d)\}$ verify $(gof)^{-1} = f^{-1}og^{-1}$

8. i) Show that $f: Q \to Q$ defined by $f(x) = 5x + 4$ is a bijection and find f^{-1}.

   ii)If the function f is defined by

$$f(x) = \begin{cases} 3x-2, x \geq 3 \\ x^2-2, -2 \leq x \leq 2 \\ 2x+1, x < -3 \end{cases}$$

   Then find the value of f(4) , f(2.5), f(-2), f(-4) , f(0) , f(-7)

   iii) If $f = \{(4,5),(5,6),(6,-4)\}$ *and* $g = \{(4,-4),(6,5),(8,5)\}$ **. Then find f + g amd f.g**

MATHEMATICAL INDUCTION

9. Show that 1.2.3 + 2.3.4 + 3.4.5 + ... upto n terms $\dfrac{n(n+1)(n+2)(n+3)}{4}, \forall n \in N$.

10. Show that $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \ldots$ upto n terms $= \dfrac{n(n+1)^2(n+2)}{12}, \forall n \in N$.

11. Show that $\dfrac{1^3}{1} + \dfrac{1^3+2^3}{1+3} + \dfrac{1^3+2^3+3^3}{1+3+5} + \ldots$ upto n terms $= \dfrac{n}{24}\left[2n^2+9n+13\right]$.

12. i) Show that $\forall n \in N, \frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+....$ upto n terms $=\frac{n}{3n+1}$.

ii) Show that $\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+.........+\frac{1}{(2n-1)(2n+1)}=\frac{n}{2n+1}, \forall n \in N.$

13. Prove by mathematical Induction a+(a+d) + (a+2d) +.....up to n terms $=\frac{n}{2}(2a+(n-1)d)$

14. Prove by Induction a+ar+ar^2 + ... up to n terms $=\frac{a(r^n-1)}{r-1}, r \neq 1,$

15. Use mathematical induction to P.T statement $2+3.2+4.2^2+$ ....+ upto n terms = n.2^n, $\forall n \in N.$

16. Show that 2.3 + 3.4 + 4.5 + ... upto n terms $=\frac{n\left(n^2+6n+11\right)}{3} \forall n \in N.$

17. By using mathematical induction Show that $49^n + 16n - 1$ divisible by 64 for all positive integers.

18. By using mathematical inductionShow that $3.5^{2n+1}+2^{3n+1}$ is divisible by 17, $\forall n \in N.$

MULTIPLICATION OF VECTORS

19. Find the shortest distance between the skew lines

$\bar{r}=\left(6i+2j+2k\right)+t\left(i-2j+2k\right) of\ \bar{r}=\left(-4i-k\right)+r\left(3i-2j-2k\right)$

20. If A = (1,2,-1) B (4,0,-3) C (1,2,-1) D (2,-4,-5) find the distance b/w AB and CD.

21. i) If $\bar{a}$=i-2j+3k, $\bar{b}$=2i+j+k, c = i + j + 2k find a×(b×c) and |(a×b)×c|

ii) If $\bar{a}$=2i+j-3k, $\bar{b}$ = i-2j+k, $\bar{c}$= - i+j -4k and $\bar{d}$ = i+j+k then find |(a×b)×(c×d)|

22. a = 3j-j+2k, b = - i+3j+2k, c = 4i+5j-2k and d = i +3j +5k then compute the following

i) (a×b) ×(c×d) ii) (a×b).c-(a×d).b

23. Let a,b,c are three vectors then

i) $(\bar{a}\times\bar{b})\times\bar{c} = (\bar{a}.\bar{c})\bar{b}-(\bar{b}.\bar{c})\bar{a}$

ii) $\bar{a}\times(\bar{b}\times\bar{c})= (\bar{a}.\bar{c})\bar{b}-(a.\bar{b})\bar{c}$

24. A line makes an angle $\theta_1, \theta_2, \theta_3, \theta_4$, with diagonals of a cube S.T

$\cos^2\theta_1 + \cos^2\theta_2 + \cos^2\theta_3 + \cos^2\theta_4 = 4/3$

25. P.T The angle θ between any two diagonals of a cube is given by cos θ=1/3

26. In any triangle. The altitudes are concurrent

27. Find the equation of plane passing through points A(2,3,-1) B (4,5,2) and C (3,6,5)

28. Show that the four points with position vectors $\bar{a},\bar{b},\bar{c},\bar{d}$ are coplanet if.

$[\bar{b}\,\bar{c}\,\bar{d}]+[\bar{c}\,\bar{a}\,\bar{d}]+[\bar{a}\,\bar{b}\,\bar{d}]=[\bar{a}\,\bar{b}\,\bar{c}]$

PROPERTIES OF TRIANGLES

29. i) If $a = 13, b = 14, c = 15$, show that $R = \frac{65}{8}, r = 4, r_1 = \frac{21}{2}$, $r_2 = 12$ and $r_3 = 14$.

ii) If $r_1 = 2, r_2 = 3, r_3 = 6$ and $r = 1$, prove that $a = 3, b = 4$ and $c = 5$

30 Show that $\frac{r_1}{bc} + \frac{r_2}{ca} + \frac{r_3}{ab} = \frac{1}{r} - \frac{1}{2R}$.

31. Show that $\frac{ab - r_1 r_2}{r_3} = \frac{bc - r_2 r_3}{r_1} = \frac{ca - r_3 r_1}{r_2}$.

32. Prove that $a^3\cos(B - C) + b^3\cos(C - A) + c^3\cos(A - B) = 3abc$.

(or)

Prove that $\sum a^3 \cos(B - C) = 3abc$.

33. If P_1, P_2, P_3 are altitudes drawn from vertices A, B, C to the opposite sides of a triangle respectively, then show that

i) $\frac{1}{P_1} + \frac{1}{P_2} + \frac{1}{P_3} = \frac{1}{r}$ ii) $\frac{1}{P_1} + \frac{1}{P_2} - \frac{1}{P_3} = \frac{1}{r_3}$ iii) $P_1 P_2 P_3 = \frac{(abc)^2}{8R^3} = \frac{8\Delta^3}{abc}$

34. Show that $a\cos^2\frac{A}{2} + b\cos^2\frac{B}{2} + c\cos^2\frac{C}{2} = s + \frac{\Delta}{R}$.

35. Prove that $\dfrac{\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2}}{\cot A + \cot B + \cot C} = \dfrac{(a+b+c)^2}{a^2 + b^2 + c^2}$.

36. In a triangle ABC, i) prove that $r_1 + r_2 + r_3 - r = 4R$.

ii)Show that $r + r_3 + r_1 - r_2 = 4R\cos B$.

iii)Show that $r + r_1 + r_2 - r_3 = 4R\cos C$

37. i) If $a^2 + b^2 + c^2 = 8R^2$, then prove that the triangle is right angled.

ii) Show that $\cos^2\frac{A}{2} + \cos^2\frac{B}{2}\cos^2\frac{C}{2} = 2 + \frac{r}{2R}$.

38. Prove that (i) $\frac{r_1(r_2 + r_3)}{\sqrt{r_1 r_2 + r_2 r_3 + r_3 r_1}} = a$. (ii) $a = (r_2 + r_3)\sqrt{\frac{r r_1}{r_2 r_3}}$ (iii) $\Delta = r_1 r_2\sqrt{\frac{4R - r_1 - r_2}{r_1 + r_2}}$.

MATRICES

39. If $A = \begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{pmatrix}$ is a non - singular matrix, then show that A is invertible and $A^{-1} = \frac{\text{adj}A}{\det A}$

40. Show that $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = \begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = \left(a^3+b^3+c^3-3abc\right)^2$

41. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and $\begin{vmatrix} a & a^2 & 1 \\ b & b^2 & 1 \\ c & c^2 & 1 \end{vmatrix} \neq 0$ then show that $abc = -1$

42. Show that $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(ab+bc+ca)$

43. Show that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

44. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

45. . Show that $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix} = (a-1)^3$

46. Show that $\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ a & b & c \end{vmatrix} = a^3+b^3+c^3-3abc$

47. Show that $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

48. Show that $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a)$

49. Solve the following simultaneous linear equation by using Cramer's rule, Matrix inversion and Gauss - Jordan method

i) $3x + 4y + 5z = 18, 2x - y + 8z = 13, 5x - 2y + 7z = 20$

ii) $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$

iii) $x + y + z = 9, 2x + 5y + 7z = 52, 2x + y - z = 0$

iv) $x + y + z = 1, 2x + 2y + 3z = 6, x + 4y + 9z = 3$

v) $x-y+3z=5, 4x+2y-z=0, -x+3y + z = 5$

50. Examine whether the following system of equations is consistent or inconsistent. If consistent find the complete solutions.

i) $x + y + z = 6, x - y + z = 2, 2x - y + 3z = 9$

ii) $x + y + z = 3, 2x + 2y - z = 3, x + y - z = 1$

iii) $x + y + z = 6, x - y + z = 2, 2x - y + 3z = 9$

TRANSFORMATIONS

51. If A,B,C are angles of a triangle then prove that

i) $\sin 2A+\sin 2B+\sin 2C = 4 \sin A \sin B \sin C$

ii) $\cos 2A+\cos 2B+\cos 2C = -4 \cos A \cos B \cos C-1$

52. If $A+B+C = \pi$ then prove that

i) $\sin A + \sin B + \sin C = 4\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

ii) $\cos A +\cos B+\cos C =1 + 4 \sin A/2 \sin B/2 \sin C/2$

53. If $A + B + C = \frac{3\pi}{2}$ then prove that

$\cos 2A +\cos 2B+\cos 2C =1 - 4 \sin A \sin B \sin C$

54. If $A+B+C = \pi$ then prove that

i) $\cos^2 A/2 + \cos^2 B/2 + \cos^2\frac{C}{2} = 2\left[1+\sin A/2 \sin B/2 \sin C/2\right]$

ii) $\cos^2 A/2 + \cos^2 B/2 - \cos^2\frac{C}{2} = 2\cos A/2 \cos B/2 \sin C/2$

iii) $\sin^2 A/2 + \sin^2 B/2 - \sin^2 C/2 = 1 - 2\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$

55. In ΔABC prove that

i) $\cos A/2 + \cos B/2 + \cos C/2 = 4\cos\left(\frac{\pi - A}{4}\right)\cos\left(\frac{\pi - B}{4}\right)\cos\left(\frac{\pi - C}{4}\right)$

ii) $\cos A/2 + \cos B/2 - \cos C/2 = 4\cos\left(\frac{\pi + A}{4}\right)\cos\left(\frac{\pi + B}{4}\right)\cos\left(\frac{\pi - C}{4}\right)$

iii) $\sin A/2 + \sin B/2 - \sin C/2 = -1 + 4\cos\left(\frac{\pi - A}{4}\right)\cos\left(\frac{\pi - B}{4}\right)\sin\left(\frac{\pi - C}{4}\right)$

iv) $\sin A/2 + \sin B/2 + \sin \frac{C}{2} = 1 + 4\sin\left(\frac{\pi - A}{4}\right)\sin\left(\frac{\pi - B}{4}\right)\sin\left(\frac{\pi - C}{4}\right)$

56. If A+B+C =2S then prove that

i) cos (S-A) +cos (S-B) +cos C= -1 +4 cos $\left(\frac{S-A}{2}\right)\cos\left(\frac{S-B}{2}\right)\cos\frac{C}{2}$

ii) cos (S-A) +cos (S-B) +cos(S-C)+cos S=4 cos $A/2$ cos $B/2$ cos $C/2$

SAQ's (4 Marks Questions)

ADDITION OF VECTORS

1. If A,B,C,D,E,F is a regular hexagon with centre 'O' show that AB+AC+AD+AE+AF=3AD=6AO
2. In Δ ABC, 'O' is circumcentre, H is orthocentre then S.T
   i) OA +OB+OC=OH, ii) HA+HB+HC=2HO
3. In the two dimensional plane prove that by using vector method the equation of the line whose intercepts on the axes are a &b is $\frac{x}{a} + \frac{y}{b} = 1$
4. If $\bar{a}, \bar{b}, \bar{c}$ are non coplanar prove that the four points are coplanar.
   i) -a+4b-3c, 3a+2b-5c, -3a+8b-5c , - 3a+2b+c
   ii) 4i + 5j + k, -j -k, 3i+9j+4k,-4i+4j+4k
5. If the points whose p.v's are 3i-2j-k,2i+3j-4k-i+j+2k and 4i+5j+ λ k are coplanar then prove that $\lambda = \frac{-146}{17}$
6. If $\bar{a}, \bar{b}, \bar{c}$ are non coplanar, test the collinearity of given points
   i) a-2b+3c,2a+3b-4c,-7b+10c
   ii) 3a-4b+3c, -4a+5b-6c,4a-7b+6c
7. Find the equation of line parallel to 2i-j+2k and which passes through point 'A' (3i+j-k). If p is a point on this line such that AP=15 find position vector of 'p'
8. Find the vector equation of palne passing through points 4i-3j-k, 3i+7j-10k and 2i+5j-7k and show that the point i+2j-3k lies in the plane
9. i) Show that the line joining the pair of points 6a-4b+4c,-4c and the line joining the pair of points -a-2b-

3c, a+2b-5c intersect at the point -4c when a,b,c are non coplanar vectors

ii) Find the point of intersection of the lines passng though the points $2\bar{a}+3\bar{b}-\bar{c}, 3\bar{a}+4\bar{b}-2\bar{c}$ with the line joining the points $\bar{a}-2\bar{b}+3\bar{c}, \bar{a}-6\bar{b}+6\bar{c}$

10. If α =(x+4y) $\bar{a}$ +(2x+y+1) $\bar{b}$ & β =(y-2x+2) $\bar{a}$ +(2x-3y-1) $\bar{b}$ are such that 3 α =2 β ,then find x and y

MULTIPLICATION OF VECTORS

11. S.T Angle in semi circle is a right angle
12. Find the unit vector perpendicular to the plane passing through the points (1, 2, 3), (2, -1, 1), (1, 2, -4).
13. Find the area of the Triangle whose vertices are A(1, 2, 3) B(2, 3 1) and C(3, 1, 2)
14. Let a,b be vectors |a| = |b| = 5 and (a,b) = 45° find area of Δ le having a-2b, 3a+2b as two of its side
15. Find the volume of tetrahedran whose vertices are (1,2,1) (3,2,5) (2,-1,0) d (-1,0,1)
16. Find 'λ', if A = (3, 2, 1), B=(4, λ ,5), C = (4, 2, -2) and D = (6, 5,-1) are coplanar
17. If $\bar{a}=2\bar{i}+3\bar{j}+4\bar{k}, \bar{b}=\bar{i}+\bar{j}-\bar{k}$ and $\bar{c}=\bar{i}-\bar{j}+\bar{k}$ Then compute $\bar{a}\times(\bar{b}\times\bar{c})$ and verify that it is perpendicular to $\bar{a}$
18. If $\bar{a}=2\bar{i}+\bar{j}-\bar{k}, \bar{b}=-\bar{i}+2\bar{j}-4\bar{k}, \bar{c}=\bar{i}+\bar{j}+\bar{k}$ then find $(\bar{a}\times\bar{b}).(\bar{b}\times\bar{c})$.
19. Find the vector having magnitude $\sqrt{6}$ and $\perp$ er to both 2i-k and 3i-j+k
20. If a+b+c = 0, |a| = 3, |b| = 5, |c| =7 find angle between $\bar{a}$ & $\bar{b}$

MATRICES

21. If $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ and $E\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$ then show that $(aI + bE)^3 = a^3 I + 3a^2 bE$

22. If $\theta-\phi=\frac{\pi}{2}$, then show that $\begin{pmatrix}\cos^2\theta & \cos\theta\sin\theta\\ \cos\theta\sin\theta & \sin^2\theta\end{pmatrix}\begin{pmatrix}\cos^2\phi & \cos\phi\sin\phi\\ \cos\phi\sin\phi & \sin^2\phi\end{pmatrix}=0$

23. i) a) If $A=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$ then show that $A^2-4A-5I=0$

ii) If $A=\begin{bmatrix}1 & -2 & 1\\ 0 & 1 & -1\\ 3 & -1 & 1\end{bmatrix}$ then find A^3-3A^2-A-3I

24. i) If $3A=\begin{pmatrix}1 & 2 & 2\\ 2 & 1 & -2\\ -2 & 2 & -1\end{pmatrix}$ then show that $A^{-1}=A^T$ ii) If $A=\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$ then show that $A^{-1}=A^3$.

25. i) If $A = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$ then for any integer $n \geq 1$. Show that $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$

ii) If $A = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ then show that for all positive integers 'n' $A^n = \begin{pmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{pmatrix}$

26. i) Show that $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ is non singular and find A^{-1}

ii) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$ then find $\left(A^T\right)^{-1}$

27. i) Show that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

ii) Find the value of x, if $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$

28. i) If $A = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 3 & -4 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -2 \\ -3 & 0 \\ 5 & 4 \end{bmatrix}$ then verify $(AB)^T = B^T A^T$ (or) $(AB)^1 = B^1.A^1$

ii) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ examine whether A and B commute w.r. to matix multiplication

29. If $A = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \end{bmatrix}, B = \begin{bmatrix} -3 & 4 & 0 \\ 4 & -2 & -1 \end{bmatrix}$ Then P.T $(A+B)^T = A^T + B^T$

30. If $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ then show that the adjoint of A is $3A^T$, and find A^{-1}

TRIGONOMETRIC EQUATIONS

31. i) Solve $7\sin^2\theta + 3\cos^2\theta = 4$

ii) Solve $2\cos^2\theta - \sqrt{3}\sin\theta + 1 = 0$

iii) Solve $\cot^2\theta-\left(\sqrt{3}+1\right)\cot\theta+\sqrt{3}=0, 0<\theta<\frac{\pi}{2}$

32. i) Solve $\tan\theta+3\cot\theta=5\sec\theta$

ii) Solve $1+\sin^2\theta=3\sin\theta\cos\theta$

iii) Solve $\sqrt{2}\left(\sin x+\cos x\right)=\sqrt{3}$

33. i) Solve $2\cos^2\theta+11\sin\theta=7$

ii) Solve $\sqrt{3}\sin\theta-\cos\theta=\sqrt{2}$

iii) $\sin x+\sqrt{3}\cos x=\sqrt{2}$

34. Find all values of $x\neq 0$ in $\left(-\pi,\pi\right)$ satisfying $8^{1+\cos x+\cos^2 x+\ldots\ldots\ldots\ldots}=4^4$

35. If x is acute and $\sin(x+10)=\cos(3x-68)$. find x in degrees

36. If θ_1,θ_2 are solutions of equation $a\cos 2\theta+b\sin 2\theta=c$ then find i) $\tan\theta_1+\tan\theta_2$ ii) $\tan\theta_1.\tan\theta_2$

37 If $\tan\left(\pi\cos\theta\right)=\cot\left(\pi\sin\theta\right)$ then prove that $\cos\left(\theta-\frac{\pi}{4}\right)=\pm\frac{1}{2\sqrt{2}}$

38. If $\tan p\theta=\cot q\theta$ and $p\neq -q$ show that the solutions are in A.P with common difference $\frac{\pi}{p+q}$

INVERSE TRIGONOMETRIC FUNCTIONS

39. i) Prove that $\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{13}-\tan^{-1}\frac{2}{9}=0$

ii) Prove that $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}$

iii) Prove that $\tan^{-1}\frac{3}{4}+\tan^{-1}\frac{3}{5}-\tan^{-1}\frac{8}{19}=\frac{\pi}{4}$

iv) Prove that $\sin^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{5}{13}\right)+\sin^{-1}\left(\frac{16}{65}\right)=\frac{\pi}{2}$

40. i) Prove that $2\sin^{-1}\frac{3}{5}-\cos^{-1}\frac{5}{13}=\cos^{-1}\frac{323}{325}$

ii) Prove that $\sin^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{7}{25}\right)=\sin^{-1}\left(\frac{117}{125}\right)$

41. i) Prove that $\sin^{-1}\left(\frac{3}{5}\right)+\sin^{-1}\left(\frac{8}{17}\right)=\cos^{-1}\left(\frac{36}{85}\right)$

ii) Prove that $\sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\cos^{-1}\left(\frac{33}{65}\right)$

42. i) If $\cos^{-1}p+\cos^{-1}q+\cos^{-1}r=\pi$ then prove taht $p^2+q^2+r^2+2pqr=1$

ii) If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$ then prove that

$$x\sqrt{1-x^2}+y\sqrt{1-y^2}+z\sqrt{1-z^2}=2xyz$$

43. i) If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi$ then prove that $x+y+z=xyz$

ii) If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\frac{\pi}{2}$ then prove that $xy+yz+zx=1$

44. i) Show that $\sec^2(\tan^{-1}2)+\operatorname{cosec}^2(\cot^{-1}2)=10$

ii) Prove that $\cos\left(2\tan^{-1}\frac{1}{7}\right)=\sin\left(4\tan^{-1}\frac{1}{3}\right)$

iii) Prove that $\cos\left(2\tan^{-1}\frac{1}{7}\right)=\sin\left(2\tan^{-1}\frac{3}{4}\right)$

45. Prove that $\tan\left[\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\left(\frac{a}{b}\right)\right]+\tan\left(\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\left(\frac{a}{b}\right)\right)=\left(\frac{2b}{a}\right)$

46. If $\cos^{-1}\frac{p}{a}+\cos^{-1}\frac{q}{b}=\alpha$, then prove that $\frac{p^2}{a^2}-2\frac{pq}{ab}.\cos\alpha+\frac{q^2}{b^2}=\sin^2\alpha$

47. Prove that $\cos[\tan^{-1}\{\sin(\cot^{-1}x)\}]=\sqrt{\frac{x^2+1}{x^2+2}}$

48. Solve for 'x'

i) $\tan^{-1}\left(\frac{x-1}{x-2}\right)+\tan^{-1}\left(\frac{x+1}{x+2}\right)=\frac{\pi}{4}$

ii) $3\sin^{-1}\left(\frac{2x}{1+x^2}\right)-4\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)+2\tan^{-1}\left(\frac{2x}{1-x^2}\right)=\frac{\pi}{3}$

PROPERTIES OF TRIANGLE

49. Show that in a triange ABC, $\tan\left(\frac{B-C}{2}\right)=\frac{b-c}{b+c}\cot\frac{A}{2}$.

50. $\cot A+\cot B+\cot C=\frac{a^2+b^2+c^2}{4\Delta}$

51. Show that $\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=\frac{a^2+b^2+c^2}{2abc}$

52. In a triange ABC, if $\frac{1}{a+c}+\frac{1}{b+c}=\frac{3}{a+b+c}$, show that $C = 60^0$.

53. Prove that $\tan\frac{A}{2}+\tan\frac{B}{2}+\tan\frac{C}{2}=\frac{bc+ca+ab-s^2}{\Delta}$.

54. i) If $a=(b-c)\sec\theta$, prove that $\tan\theta=\frac{2\sqrt{bc}}{b-c}\sin\frac{A}{2}$.

ii) If $\sin\theta=\frac{a}{b+c}$, then show that $\cos\theta=\frac{2\sqrt{bc}}{b+c}\cos\frac{A}{2}$.

55. Show that $\frac{1}{r^2}+\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}=\frac{a^2+b^2+c^2}{\Delta^2}$.

56. i) Show that $(b-c)^2\cos^2\frac{A}{2}+(b+c)^2\sin^2\frac{A}{2}=a^2$.

ii) If a : b : c = 7 : 8 : 9, find cos A : cos B : cos C.

57. If $\cot\frac{A}{2},\cot\frac{B}{2},\cot\frac{C}{2}$ are in A.P., then prove that a, b, c are in A.P.

58. i) Show that $a^2\cot A+b^2\cot B+c^2\cot C=\frac{abc}{R}$.

. ii)If a, b, c are in A.P., then show that $3\tan\frac{A}{2}\tan\frac{C}{2}=1$.

TRIGNOMETRIC RATIOS AND IDENTITIES

59. i) If $A-B=\frac{3\pi}{4}$ then show that (1-tan A) (1 + tan B) = 2

ii) If $A+B=\frac{\pi}{4}$ then prove that

a) (1+ tan A) (1+tan B) = 2

b) (cot A -1) (cot B-1) = 2

60. If A,B,C are angles of triangle. Then

i) tan A + tan B + tan C = tan A tan B tan C

ii) cot A cot B + cotB cot C +cot C cot A = 1

61. Prove that $\frac{1}{\sin 10}-\frac{\sqrt{3}}{\cos 10}=4$

62. If $0 < A < B < \frac{\pi}{4}$ and $\sin(A+B) = \frac{24}{25}$ and $\cos(A-B) = \frac{4}{5}$ then find the value of tan2A

63. Prove that i) $\tan A + \cot A = 2\operatorname{cosec} 2A$

ii) $\cot A - \tan A = 2\cot 2A$

64. Prove that

i) $\sin A \sin\left(\frac{\pi}{3}+A\right)\sin\left(\frac{\pi}{3}-A\right) = \frac{1}{4}\sin 3A$ ii) $\cos A \cos\left(\frac{\pi}{3}+A\right)\cos\left(\frac{\pi}{3}-A\right) = \frac{1}{4}\cos 3A$

iii) $\sin 20 \sin 40 \sin 60 \sin 80 = \frac{3}{16}$ iv) $\cos\frac{\pi}{9}\cos\frac{2\pi}{9}\cos\frac{3\pi}{9}\cos\frac{4\pi}{9} = \frac{1}{16}$

65. If $\frac{\sin\alpha}{a} = \frac{\cos\alpha}{b}$ then prove that $a\sin 2\alpha + b\cos 2\alpha = b$

66. i) If $\cos\theta = \frac{5}{13}\, and\, 270^0 < \theta < 360^0$ find $\sin\frac{\theta}{2}, \cos\frac{\theta}{2}$

ii) If $180^0 < \theta > 270^0$ and $\sin\theta = \frac{-4}{5}$ find $\sin\frac{\theta}{2}, \cos\frac{\theta}{2}$

67. i) Show that $\cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{5\pi}{8} + \cos^2\frac{7\pi}{8} = 2$

ii) Show that $\sin^4\left(\frac{\pi}{8}\right) + \sin^4\frac{3\pi}{8} + \sin^4\frac{5\pi}{8} + \sin^4\frac{7\pi}{8} = \frac{3}{2}$

68. i) Prove that $\sin\frac{\pi}{5}\sin\frac{2\pi}{5}\sin\frac{3\pi}{5}\sin\frac{4\pi}{5} = \frac{5}{16}$

ii) Prove that $\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}\cos\frac{8\pi}{7} = \frac{1}{8}$

iii) Prove that $\cos\frac{\pi}{11}\cos\frac{2\pi}{11}\cos\frac{3\pi}{11}\cos\frac{4\pi}{11}\cos\frac{5\pi}{11} = \frac{1}{32}$

69. Prove that $\left(1+\cos\frac{\pi}{10}\right)\left(1+\cos\frac{3\pi}{10}\right)\left(1+\cos\frac{7\pi}{10}\right)\left(1+\cos\frac{9\pi}{10}\right) = \frac{1}{16}$

70. If $A \neq n\pi / n \in Z$ prove that $\cos A.\cos 2A \cos 4A \cos 8A = \frac{\sin 16A}{16\sin A}$ hence deduce

$\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{16\pi}{15} = \frac{1}{16}$

71. iii) If $\tan x + \tan\left(x+\frac{\pi}{3}\right) + \tan\left(x+\frac{2\pi}{3}\right) = 3$ then show that tan 3x = 1

72. If $\sec(\theta+\alpha) + \sec(\theta-\alpha) = 2\sec\theta\, and\, \cos\alpha \neq 1$ then show that $\cos\theta = \pm\sqrt{2}\cos\left(\frac{\alpha}{2}\right)$

VSAQ's (2 MARKS)

FUNCTIONS

1. If $A=\{-2,-1,1,2\}$ and $f:A\to B$ is a surjection defines by $f(x)=x^2+x+1$ then find B.
2. If $A=\left\{0,\frac{\pi}{6},\frac{\pi}{4},\frac{\pi}{3},\frac{\pi}{2}\right\}$ *and* $f:A\to B$ is a surjection defined by $f(x)=\cos x$ then find B.
3. If $f=\{(4,5),(5,6),(6,-4)\}$ and $g=\{(4,-4),(6,5),(8,5)\}$ then find
   i) $f+g$ ii) $f-g$ iii) $f.g$ iv) $\sqrt{f}$
4. If $f=\{(1,2),(2,-3),(3,-1)\}$ then find
   i) $2f$ ii) f^2
5. If $f(x)=2x-1, g(x)-\frac{x+1}{2}$ then find $gof(x)$
6. If $f(x)=3x-1$ and $g(x)=x^2+1$ then find
   i) $fog(2)$ ii) $fof(x^2+1)$ iii) $gof(2a-3)$
7. If $f(x)=4x-1, g(x)=x^2+2$ then find
   i) $gof(x)$ ii) $fog(x)$ iii) $gof\left(\frac{a+1}{4}\right)$ iv) $gofof(x)$
8. If $f(x)=2, g(x)=x^2, h(x)=2x$ then find $fogoh(x)$
9. If $f(x)=\frac{x+1}{x-1}$ then find $fofof(x)$.
10. If $f:Q\to Q$ is defined by $f(x)=5x+4$ then find f^{-1}.
11. If $f(x)=ax+b$ then find the inverse function
12. Find the inverse functions of $f(x)=\log_2^x$ *and* 5^x
13. If $f:R\to R$ defines by $f(x)=\frac{2x+1}{3}$ then f is injection or not? Justify
14. Find the domain of the following real functions.
    i) $f(x)=\sqrt{16-x^2}$ ii) $f(x)=\sqrt{x^2-25}$ iii) $f(x)=\sqrt{4x-x^2}$ iv) $f(x)=\frac{1}{\sqrt{1-x^2}}$
    v) $f(x)=\log(x^2-4x+3)$
15. Find the domain of the following real functions.
    i) $f(x)=\frac{1}{\log(2-x)}$ ii) $f(x)=\frac{\sqrt{2+x}+\sqrt{2-x}}{x}$
    iii) $f(x)=\frac{2x^2-5x+7}{(x-1)(x-2)(x-3)}$ iv) $f(x)=\frac{1}{(x^2-1)(x+3)}$ v) $f(x)=\frac{1}{6x-x^2-5}$
16. Find the domain and range of the following function
    i) $f(x)=\frac{x^2-4}{x-2}$ ii) $f(x)=\frac{x}{2-3x}$ iii) $f(x)=\sqrt{9-x^2}$
17. If $f(x)=\frac{\cos^2 x+\sin^4 x}{\sin^2 x+\cos^4 x}$ then show that $f(2012)=1$
18. If $f(x)=\frac{y}{\sqrt{1-y^2}}: g(y)=\frac{y}{\sqrt{1+y^2}}$ then show that $fog(y)=y$.

19. If $f(x)=x^3-\frac{1}{x^3}$ then show that $f(x)+\left(\frac{1}{x}\right)=0$

20. If $f,g:R\rightarrow R$ are defined by $f(x)=\begin{cases}0, & if \quad x\in Q\\ 1, & if \quad x\notin Q\end{cases}$ and $g(x)=\begin{cases}-1, & if \quad x\in Q\\ 0, & if \quad x\notin Q\end{cases}$ then find $(fog)(\pi)+(gof)(e)$

MATRICES

21. i) If $\begin{bmatrix}x-3 & 2y-8\\ z+2 & 6\end{bmatrix}=\begin{bmatrix}5 & 2\\ -2 & a-4\end{bmatrix}$ then find $x,y,z,a.$

ii) If $\begin{bmatrix}x-1 & 2 & 5-y\\ 0 & z-1 & 7\\ 1 & 0 & a-5\end{bmatrix}=\begin{bmatrix}1 & 2 & 3\\ 0 & 4 & 7\\ 1 & 0 & 0\end{bmatrix}$ then find $x,y,z,a.$

22. i) If $A=\begin{bmatrix}1 & 2 & 3\\ 3 & 2 & 1\end{bmatrix}$ and $B=\begin{bmatrix}3 & 2 & 1\\ 1 & 2 & 3\end{bmatrix}$ Then find 3B – 2A.

ii) If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix},B=\begin{bmatrix}3 & 8\\ 7 & 2\end{bmatrix}$ and $2x+A=B$ then fin x.

23. Defined trance a matrix. And find then trace of $\begin{bmatrix}1 & 3 & -5\\ 2 & -1 & 5\\ 2 & 0 & 1\end{bmatrix}$.

24. Construct a 3 x 2 matrix whose elements area a defined by $a_{ij}=\frac{1}{2}.|i-3j|$

25. A certain book shop has 10 dozen chemistry books, 8 dozen physics books 10 dozen economic books, their selling prices are Rs.80, Rs.60, Rs.40 each rlly. Using matrix algebra, find the total value of the books.

26. If $A=\begin{bmatrix}i & 0\\ 0 & -i\end{bmatrix}$ then show that $A^2=-I$

ii) If $A=\begin{bmatrix}2 & 4\\ -1 & k\end{bmatrix}$ and $A^2=\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$ then $k=?$

27. If $A=\begin{bmatrix}-2 & 1 & 0\\ 3 & 4 & -5\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2\\ 4 & 3\\ -1 & 5\end{bmatrix}$ then $A+B^1$

ii) If $A=\begin{bmatrix}2 & -4\\ -5 & 3\end{bmatrix}$ then $A+A^1 \; and \; A.A^1=?$

28. If $A=\begin{bmatrix}-1 & 2\\ 0 & 1\end{bmatrix}$ then find $A.A^1$, Do A and A^1 commute w.r.t multiplication of matrices.

ii) If $A=\begin{bmatrix}2 & 0 & 1\\ -1 & 1 & 5\end{bmatrix}$ and $B=\begin{bmatrix}-1 & 1 & 0\\ 0 & 1 & -2\end{bmatrix}$ then find $(A.B^1)^1$

29. Define triangular matrix

30. Define symmetric and skew-symmetric matrix and give an example to each.

31. i) $A=\begin{bmatrix}0 & 1 & 4\\ -1 & 0 & 7\\ -4 & -7 & 0\end{bmatrix}$ symmetric (or) skew symmetric.

ii) If $A=\begin{bmatrix}-1 & 2 & 3\\ 2 & 5 & 6\\ 3 & x & 7\end{bmatrix}$ is symmetric then find the value of X.

32. i) If $A=\begin{bmatrix}0 & 2 & 1\\ -2 & 0 & -2\\ -1 & x & 0\end{bmatrix}$ is a stew symmetric then find x.

ii) $A=\begin{bmatrix}0 & 4 & -2\\ -4 & 0 & 8\\ 2 & -8 & x\end{bmatrix}$ is a skew system then find x.

33. Find the minor of -1 and 3 in the matrix $\begin{bmatrix}2 & -1 & 4\\ 0 & -2 & 5\\ -3 & 1 & 3\end{bmatrix}$

34. Find the c0factors of 2 and -5 in the matrix $\begin{bmatrix}-1 & 0 & 5\\ 1 & 2 & -2\\ -4 & -5 & 3\end{bmatrix}$

35. If $A=\begin{bmatrix}1 & 0 & 0\\ 2 & 3 & 4\\ 5 & -6 & x\end{bmatrix}$ and det A = 45 then find x.

36. Show that $\begin{vmatrix}1 & w & w^2\\ w & w^2 & 1\\ w^2 & 1 & w\end{vmatrix}=\theta$

37. Find the Adjoint and inverse of the matrix $A=\begin{bmatrix}2 & -3\\ 4 & 6\end{bmatrix}$

ii) Find the adjoint and Inverse of the matrix $\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$.

38. Define rank of a matrix.

39. Find the rank of the following.

i) $A=\begin{bmatrix}1 & 4 & -1\\ 2 & 3 & 0\\ 0 & 1 & 2\end{bmatrix}$ ii) $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}$ iii) $A=\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$

40. Solve the following system of homogeneous equations $x-y=z=0, x+2y-z=0, 2x+y+3z=0$

VECTORS

41. If the vectors $\bar{a}=2\bar{i}+5\bar{j}+\bar{k},\ \bar{b}=4\bar{i}+m\bar{j}+n\bar{k}$ are collinear the m, n

42. If the vectors $\bar{a}=-3\bar{i}+4\bar{j}+\lambda\bar{k},\ \mu\bar{i}+8\bar{j}+6\bar{k}$ are collinear then find λ,μ

43. If $4\bar{i}+\frac{2p}{3}\bar{j}+P\bar{k}$ is parallel to the vector $\bar{i}+2\bar{j}+3\bar{k}$ then find P.

44. Find the unit vector in the direction of vector $\bar{a} = 2\bar{i} + 3\bar{j} + \bar{k}$.

45. Find the unit vector in the direction of the sum of the vectors $\bar{a} = 2\bar{i} + 2\bar{j} - 5\bar{k}$, $\bar{b} = 2\bar{i} + \bar{j} + 3\bar{k}$.

46. If $\bar{a} = 2\bar{i} + 4\bar{j} - 5\bar{k}, \bar{b} = \bar{i} + \bar{j} + \bar{k}, \bar{c} = \bar{j} + \bar{k}$ then find the unit vector in the opposite direction of $\bar{a} + \bar{b} + \bar{c}$

47. If $\overline{OA} = \bar{i} + \bar{j} + \bar{k}$, $\overline{AB} = 3\bar{i} - 2\bar{j} + \bar{k}, \overline{BC} = \bar{i} + 2\bar{j} - 2\bar{k}, \overline{CD} = 2\bar{i} + \bar{j} + 3\bar{k}$ then find the vector of $\overline{OD}$.

48. If OABC is a parallelogram. If $\overline{OA} = \bar{a}$, $\overline{OC} = \bar{c}$ then find the vector equation of the side $\overline{BC}$.

49. If $\bar{a}, \bar{b}, \bar{c}$ are he position vectors of the vertices A, B, rlly of tringle ABC then the vector equation of the median through the vertex A.

50. Show that a points whose P.V are $-2\bar{a} + 3\bar{b} + 5\bar{c}, +\bar{a} + 2\bar{b} + 3\bar{c}, 7\bar{a} - \bar{c}$, are collinear

51. i) Find the vector equation of the line passing through the point $2\bar{i} + \bar{j} + 3\bar{k}$ and parallel to the vector $4\bar{i} - 2\bar{j} + 3\bar{k}$.

ii) Find the vector equation of the line passing through the points $2\bar{i} + \bar{j} + 3\bar{k}, -4\bar{i} + 3\bar{j} - \bar{k}$.

iii) Find the vector equation of the plane passing through the points $\bar{i} - 2\bar{j} + 5\bar{k}, -5\bar{j} - 5\bar{k}, -3\bar{i} + 5\bar{j}$

52. If the position vectors of the points A,B,C are $-2\bar{i} + \bar{j} - \bar{k}, -4\bar{i} + 2\bar{j} + 2\bar{k}$ and $6\bar{i} - 3\bar{j} - 13\bar{k}$ rlly, $\overline{AB} = \lambda.\overline{AC}$ then find λ'.

53. Find the equation of the plane which possess through the points $2\bar{i} + 4\bar{j} + 2\bar{k}, 2\bar{i} + 3\bar{j} + 5\bar{k}$ and parallel to the vector $3\bar{i} - 2\bar{j} + \bar{k}$.

54. i) Show that the points $2\bar{i} - \bar{j} + \bar{k}$ $\bar{i} - 3\bar{j} - 5\bar{k}$, $3\bar{i} - 4\bar{j} - 4\bar{k}$ are the vertices of aright angled triangle.

ii) Show that the point $3\bar{i} + 5\bar{j} + 2\bar{k}, 2\bar{i} - 3\bar{j} - 5\bar{k}, -5\bar{i} - 2\bar{j} + 3\bar{k}$ are vertices of an equilateral triangle.

55. If α, β, r be the angle made by the vector $3\bar{i} - 6\bar{j} + 2\bar{k}$ with the positive direction of the co-ordinate axes then $\cos\alpha, \cos\beta\, and\, \cos\gamma$

PRODUCT OF VECTORS

56. Find the angle between two vectors $\bar{i} + 2\bar{j} + 3\bar{k}$ and $3\bar{i} - \bar{j} + 2\bar{k}$.

57. Find the angle between the planes $\bar{r}.(2\bar{i} - \bar{j} + 2\bar{k}) = 3$ and $\bar{r}.(3\bar{i} + 6\bar{j} + \bar{k}) = 4$.

58. If $\bar{a} = 2\bar{i} + 2\bar{j} - 3\bar{k}$, $\bar{b} = 3\bar{i} - \bar{j} + 2\bar{k}$ then find the angle between $2\bar{a} + \bar{b}$, $\bar{a} + 2\bar{b}$.

59. If the vectors $2\bar{i} + \lambda\bar{j} - \bar{k}$ and $4\bar{i} - 2\bar{j} + 2\bar{k}$ are perpendicular each other then find λ

60. If $\bar{a} = \bar{i} + 2\bar{j} - 3\bar{k}, \bar{b} = 3\bar{i} - \bar{j} + 2\bar{k}$ then show that $\bar{a} + \bar{b}, \bar{a} - \bar{b}$ are perpendicular

61. If the vectors $\lambda\bar{i} - 3\bar{j} + 5\bar{k}, 2\lambda\bar{i} - \lambda\bar{j} - \bar{k}$ are perpendicular to each other then find λ.

62. If $\bar{a} = \bar{i} - \bar{j} - \bar{k}, \bar{b} = 2\bar{i} - 3\bar{j} + \bar{k}$ then find the projection vector of $\bar{b}$ on $\bar{a}$ and it's magnitude.

63. Find a unit vector perpendicular to the plane containing the vectors $\bar{a} = 4\bar{i} + 3\bar{j} - \bar{k}, \bar{b} = 2\bar{i} - 6\bar{j} + 3\bar{k}$

64. Find the area of the parallelogram whose adjacent sides are $2\bar{j} - \bar{k}, -\bar{i} + \bar{k}$.

65. Find the area of the parallelogram whose diagonals are $3\bar{i} + \bar{j} - 2\bar{k}$, $\bar{i} - 3\bar{j} + 4\bar{k}$

66. Find the volume of the parallelepiped having coterminous edges $\bar{i} + \bar{j} + \bar{k}$, $\bar{i} - \bar{j}, \bar{i} + 2\bar{j} - \bar{k}$

67. Find the volume of the tetrahedron having he edges $\bar{i} + \bar{j} + \bar{k}$, $\bar{i} - \bar{j}$, $\bar{i} + 2\bar{j} + \bar{k}$

68. If $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}, \bar{b} = 3\bar{i} + 4\bar{j} - \bar{k}, \theta$ is the angle between $\bar{a}, \bar{b}$ then find $\sin\theta$

69. If $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}, \bar{b} = \bar{i} + 2\bar{j} - 3\bar{k}, \bar{c} = 3\bar{i} + p\bar{j} + 5\bar{k}$ are coplanar the find P.

70. Find the equation of the plane through the point (3, -2), 1) and perpendicular to the vector (4, 7, -4)

TRIGONEMETRY UP TO TRANSFORMASSION

71. If $\cos\theta + \sin\theta = \sqrt{2}.\cos\theta$ then prove that $\cos\theta - \sin\theta = \sqrt{2}.\sin\theta$

72. If $3\sin\theta + \cos\theta = 5$ then find $4\sin\theta - 3\cos\theta$

73. Show that $\cot\frac{\pi}{16}.\cot\frac{2\pi}{16}.\cot\frac{3\pi}{16}.....\cot\frac{7\pi}{16} = 1$

74. If $\tan 20^0 = \lambda$ then show that $\frac{\tan 160^0 - \tan 110^0}{1 + \tan 160^0 - \tan 110^0} = \frac{1-\lambda^2}{2\lambda}$

75. Prove that $\frac{1}{\sin 10^0} - \frac{\sqrt{3}}{\cos 10^0} = 4$

76. Prove that $\frac{\cos 9^0 + \sin 9^0}{\cos 9^0 - \sin 9^0}$

77. i) If $\sin\theta = \frac{-1}{3}, \theta$ does not ile in 3rd quadrant. Then find $\cos\theta$

ii) If $\sin\theta = \frac{4}{3}$ and θ is not in Q_1 and $\cos\theta$ the find $\cos\theta$

78. Eliminate θ from the equations $x = a\cos^3\theta, y = b\sin^3\theta$

79. Prove that $\tan 50^0 - \tan 40^0 = 2\tan 10^0$

80. Show that $\cos 48^0.\cos 12^0 = \frac{3+\sqrt{5}}{8}$

81. $\sin^2 82\frac{1}{2}^0 - \sin^2 22\frac{1}{2}^0$

82. $\cos^2 52\frac{1}{2}^0 - \sin^2 22\frac{1}{2}^0$

83. i) Find the period of the functions $f(x) = \sin(5x+3)$

ii) Find the period of the function $f(x) = \cos\left(\frac{4x+9}{5}\right)$

iii) Find the period of the functions $f(x) = \tan(x + 4x + 9x + ... + n^2x)$

iv) Find a $\sin$ function whose period is $\frac{2}{3}$

v) Find a $\cos$ function whose period is7.

84. Find the maximum and minimum values (or) extreme values (or) Range of the following functions.

i) $f(x) = 3\cos x + 4\sin x$ ii) $f(x) = 5\sin x + 12\cos x - 13$ iii) $f(x) = 13.\cos x + 3\sqrt{3}\sin x - 4$

85. If $\sin\alpha = \frac{3}{5}$, where $\frac{\pi}{2} < \alpha < \pi$, evaluate $\cos 3\alpha$.

86. If $\sin\alpha = \frac{1}{\sqrt{10}}, \sin\beta = \frac{1}{\sqrt{5}}$ and α, β are acute, then show that $\alpha + \beta = \pi/4$.

87. If $a(\cos\theta - b\sin\theta = c$ then show that $a\sin\theta + b\cos\theta = \pm\sqrt{a^2 - b^2 - c^2}$

88. Find the equation of the plane passing through the point (3, -2, 1) and perpendicular to the vector (4, 7,-4)

89. Express $\frac{(\sqrt{3}.\cos 25^0 + \sin 25^0)}{2}$ as a sine of an angle.

90. Express $\frac{1-\cos\theta+\sin\theta}{1+\cos\theta+\sin\theta}$ in terms of $Tan\frac{\theta}{2}$.

HYPERBOLIC FUNCTIONS

91. If $\sinh(x) = \frac{3}{4}$ then find $\cosh(2x)$ and $\sinh(2x)$

92. If $\cosh(x) = \frac{5}{2}$ then. Find $\cosh(2x), \sinh(2x)$

93. Prove that $\cosh^4(x) - \sinh h^4(x) = \cosh(2x)$

94. If $\sinh(x) = 3$ then show that $x = \log(3+\sqrt{10})$

95. Show that $\tan^{-1}\frac{1}{2} = \frac{1}{2}\log_e^3$

96 If $\cosh(x) = \sec\theta$ then prove that $\tan^2\frac{x}{2} = \tan^2\frac{\theta}{2}$

97. Prove that $\left[(\cosh(x) - \sinh(x)\right]^n = \cosh(nx) - \sinh(nx)$.

98. Prove that
i) $\sinh(x+y) = \sinh(x).\cosh(y) + \cosh(x).\sinh(y)$
ii) $\cosh(x+y) = \cosh(x)\cosh(y) + \sinh(x).\sinh(x)$

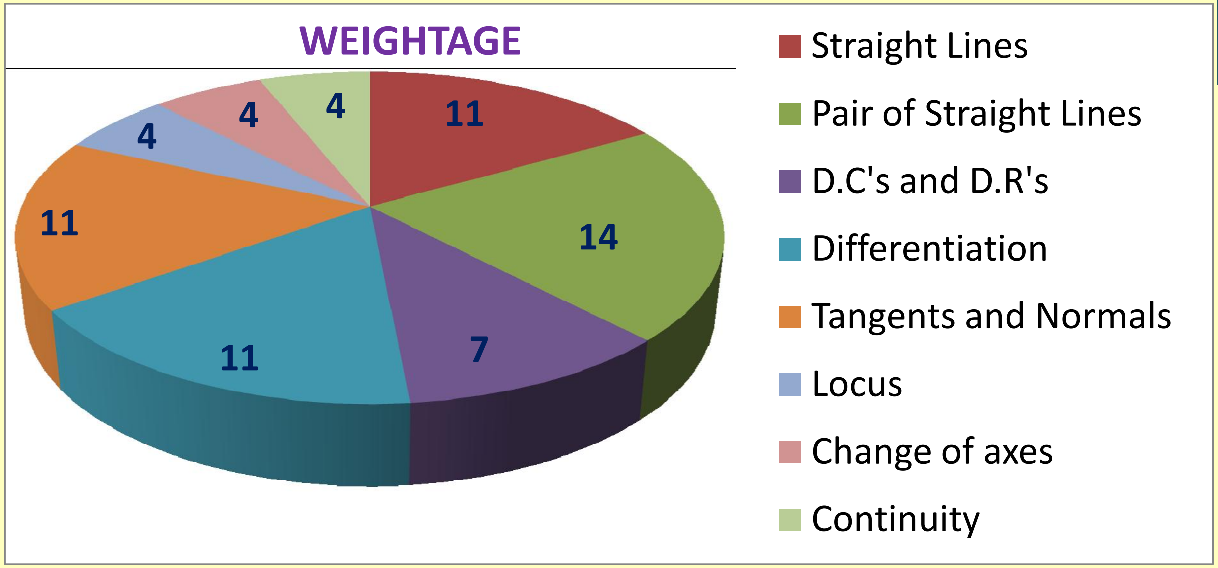
99. Prove that $\sinh^{-1}(x) = \log_e(x+\sqrt{x^2+1})$

100. Prove that $\tanh^{-1}(x) = \frac{1}{2}\log_e\left(\frac{1+x}{1-x}\right)$

MATHS - 1B TOPIC WISE WEIGHTAGE

How to Score Minimum 45-65 Marks For Slow Learners

S.NO	CHAPTER NAME	EASY / MODERATE	NO OF QUESTIONS		WEIGHTAGE
			LAQ's	SAQ's	
1	Straight Lines	Easy	14	8	**11**
2	Pair of Straight Lines	Moderate	17	-	**14**
3	D.C's and D.R's	Easy	7	-	**7**
4	Differentiation	Difficult	10	8	**11**
5	Tangents and Normals	Difficult	8	6	**11**
6	Locus	Easy	-	12	**4**
7	Change of axes	Easy	-	5	**4**
8	Continuity	Moderate	-	5	**4**
	TOTAL		56	44	**66**



VSAQ's

Chapter Name	No of Questions	Minimum No of Marks
Straigt Lines	18	4
3D-Geometry	11	2
Planes	9	2
Mean value Theorem	8	2
Total	**46**	**10**

Number of Questions Covered In these Topics

	Minimum		Maximum	
	Question	Marks	Question	Marks
LAQ's	4	28	5	35
SAQ's	3	12	5	20
VSAQ's	4	5	5	10
Total	**11**	**45**	**15**	**65**

MATHS-1B

LAQ's (7 Marks Questions)

STRAIGHT LINE

1. If p and q are the lengths of the perpendiculars from the origin to the straight lines $x\sec\alpha + y\operatorname{cosec}\alpha = a$ and $x\cos\alpha - y\sin\alpha = a\cos 2\alpha$, prove that $4p^2 + q^2 = a^2$.

2. If Q(h,k) is the image of the point P (x_1, y_1) w.r.t the straight line ax + by + c = 0. Then $\frac{h-x_1}{a} = \frac{k-y_1}{b} = \frac{-2(ax_1+by_1+c)}{a^2+b^2}$ and find the image of (1, -2) w.r.t. The straight line 2x-3y+5= 0.

3. If Q(h,k) is the foot of the perpendicular from P (x_1, y_1) on the line ax + by + c= 0, then prove that $\frac{h-x_1}{a} = \frac{k-y_1}{b} = \frac{-(ax_1+by_1+c)}{a^2+b^2}$. Also find the foot of the perpendicular from (-1,3) on the line $5x - y - 18 = 0$.

4. Find the equations of the straight lines passing through the point of intersection of the lines

   3x + 2y +4= 0, 2x + 5y =1 and whose distance from (2, -1) is 2.

5. Find the circumcentre of the triangle with the vertices (-2,3),(2,-1) and (4,0)

6. Find the circumcentre of the triangle formed by the points (1,3), (0,–2), (–3, 1)

7. Find the circum center of the triangle whose vertices are (1,3), (-3, 5) and (5, -1).

8. Find the circumcentre of the triangle whose sides are 3x-y-5=0, x +2y -4= 0 and 5x +3y +1= 0.

9. Find the circum centre of the triangle with vertices (-2,3) (2,-1) (4,0)

10. If the equations of the sides of a triangle are 7x +y -10 =0, x-2y+5= 0 and x + y +2=0. Find the orthocentre of the triangle.

11. Find the orthocentre of the triangle with the vertices (-2, -1), (6, -1) and (2,5).

12. Find the orthocentre of the triangle with the vertices (–5, –7), (13,2) & (–5, 6)

13. The base of an equilateral Δ^{le} is x+y-2=0 and opposite vertex is (2,-1). Find the equation of the remaining sides?

14. Find the equations of the straight lines passing through the point (1,2) and making an angle of 60^0 with the line $\sqrt{3}x + y + 2 = 0$ s

PAIR OF STRAIGHT LINES

15. Let the equation $ax^2 + 2hxy + by^2 = 0$ repsresents a pair of straight lines. Then the angle θ between the lines is given by $\cos\theta = \frac{a+b}{\sqrt{(a-b)^2+4h^2}}$ hence deduce tance.

16. Show that the product of the perpendicular distances from a point (α, β) to the pair of straight lines

$ax^2 + 2hxy + by^2 = 0$ is $\dfrac{|a\alpha^2 + 2h\alpha\beta + b\beta^2|}{\sqrt{(a-b)^2 + 4h^2}}$.

17. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lx + my + n = 0$ is $\dfrac{n^2\sqrt{h^2 - ab}}{|am^2 - 2hlm + bl^2|}$ sq. units

18. If the equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of distinct (i.e., intersecting) lines, then the combined equation of the pair of bisectors of the angles between these lines is $h(x^2-y^2) = (a-b)xy$.

19. If the equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of parallel straight lines, then show that (i) $h^2 = ab$ (ii) $af^2 = bg^2$ and (iii) the distance between the parallel lines is $2\sqrt{\dfrac{g^2 - ac}{a(a+b)}} = 2\sqrt{\dfrac{f^2 - bc}{b(a+b)}}$.

20. If the second degree equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ in two variables x and y represents a pair of straight lines, then

    (i) $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$ and (ii) $h^2 \geq ab,\ g^2 \geq ac$ and $f^2 \geq bc$

21. Find the values of k, if the lines joining the origin to the points of intersection of the curve

    $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the line $x + 2y = k$ are mutually perpendicular.

22. Find the angle between the lines joining the origin to the points of intersection of the curve

    $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line $3x - y + 1 = 0$.

23. Show that the lines joining the origin to the points of intersection of the curve

    $x^2 - xy + y^2 + 3x + 3y - 2 = 0$ and the straight line $x - y - \sqrt{2} = 0$ are mutually perpendicular.

24. Find the condition for the lines joining the origin to the points of intersection of the circle $x^2 + y^2 = a^2$ and the line $lx + my = 1$ to coincide.

25. Find the condition for the chord $lx + my = 1$ of the circle $x^2 + y^2 = a^2$ to subtend a right angle at the origin.

26. Find the equation to the pair of lines joining the origin to the points of intersection of the curve $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$ with the straight the $3x - y = 2$ and the angle between them.

27. Find the equations of the pair of straight line joining the origin to the point of intersection of the line $6x - y + 8 = 0$ with the pair of straight lines $3x^2 + 4xy - 4y^2 - 11x + 2y + 6 = 0$. Show that the lines so obtained makes equal angles with the coordinate axes.

28. Show that the pair of straight lines i) $6x^2 - 5xy - 6y^2 = 0$ and $6x^2 - 5xy - 6y^2 + x + 5y - 1 = 0$ forms a square.

    ii) $3x^2 + 8xy - 3y^2 = 0$ and $3x^2 + 8xy - 3y^2 + 2x - 4y - 1 = 0$ from a square

29. Find the centroid and area of the triangle formed by the lines

i) $12x^2-20xy+7y^2=0, 2x-3y+4=0$ ii) $2y^2-xy-6x^2=0, x+y+4=0$

30. Show the following lines from an equilateral triangle and find the area of the triangle

$(x+2a)^2-3y^2=0, x=a$

31. If the equation λx^2-10xy+12y^2+5x-16y-3=0 represents a pair of straight lines then find 'λ'

and also find angle between lines and point of intersetion of the lines for this value of 'λ'

DIRECTION COSINES AND DIRECTION RATIOS

32. i)If a ray makes the angles α, β, γ and δ with four diagonals of a cube then prove that $\cos^2\alpha+\cos^2\beta+\cos^2\gamma+\cos^2\delta$ = 4/3.

ii) Find the angle between two diagonals of a cube

33. Find the angle between two diagonals of a cube.

34. Find the angle between the lines whose direction cosines satisfy the equations

i) $l+m+n=0$, $l^2+m^2-n^2=0$ ii) $3l+m+5n=0$ and $6mn-2nl+5lm=0$.

35. Find the direction cosines of two lines which are connected by the relation

i) $\ell-5m+3n=0$ and $7\ell^2+5m^2-3n^2=0$

ii) $l+m+n=0$ and $mn-2nl-2lm=0$.

36. Show that the lines whose D.C's are given by $\ell+m+n=0$, $2mn+3n\ell-5\ell m=0$ are perpandicular to each other.

37. The vertices of Δ ABC are A (1 , 4, 2), B(-2 , 1, 2) ,C (2, 3, -4) .Find $\angle A, \angle B, \angle C$

38. Show that the four points (5,-1,1),(-1,-3,4)(1,-6,10),(7,-4,7) taken in order form a rhombus

DIFFERENTIATION

39. If $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$ then show that $\dfrac{dy}{dx}=\sqrt{\dfrac{1-y^2}{1-x^2}}$

40. Find $\dfrac{dy}{dx}$ if i) $y=(\sin x)^x+x^{\sin x}$ ii) $y=x^{\tan x}+(\sin x)^{\cos x}$, iii) $(\sin x)^{\tan x}+x^{\cos x}$

41. If $y=Tan^{-1}\left[\dfrac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right]$ for $0<|x|<1$ find $\dfrac{dy}{dx}$.

42. If $y=x\sqrt{a^2+x^2}+a^2\log\left(x+\sqrt{a^2+x^2}\right)$ then prove that $\dfrac{dy}{dx}=2\sqrt{a^2+x^2}$.

43. If $x^y+y^x=a^b$ then show that $\dfrac{dy}{dx}=-\left[\dfrac{yx^{y-1}+y^x\log y}{x^y\log x+xy^{x-1}}\right]$

44. If $x^y = y^x$ then show that $\frac{dy}{dx} = \frac{y(x\log y - y)}{x(y\log x - x)}$.

45. If $f(x) = \sin^{-1}\sqrt{\frac{x-\beta}{\alpha-\beta}}$ and $g(x) = Tan^{-1}\sqrt{\frac{x-\beta}{\alpha-x}}$ then show that $f^1(x) = g^1(x)$ $(\beta < x < \alpha)$.

46. If $y = Tan^{-1}\left(\frac{2x}{1+x^2}\right) + Tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right) - Tan^{-1}\left(\frac{4x-4x^3}{1-6x^2+x^4}\right)$ then show that $\frac{dy}{dx} = \frac{1}{1+x^2}$.

47. Find the derivative $\frac{dy}{dx}$ of the function $y = \frac{(1-2x)^{2/3}(1+3x)^{-3/4}}{(1-6x)^{5/6}(1+7x)^{-6/7}}$

48. Find the derivative of $f(x) = Tan^{-1}\left(\frac{2x}{1-x^2}\right)$ w.r to $g(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$.

TANGENTS AND NORMALS

49. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the coordinate axes in A and B, then show that the length AB is a constant.

50. If the tangent at any point P on the curve $x^m y^n = a^{m+n}$ $(mn \neq 0)$ meets the coordinate axes in A and B then show that AP : BP is a constant.

51. Show that the equation of tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at the point (x_1, y_1) is $xx_1^{-\frac{1}{2}} + yy_1^{-\frac{1}{2}} = a^{\frac{1}{2}}$

52. Show that the curves $y^2 = 4(x+1)$ and $y^2 = 36(9-x)$ intersect orthogonally.

53. Show that the curves $6x^2-5x+2y=0$ and $4x^2+8y^2=3$ touch eachother at $\left(\frac{1}{2}, \frac{1}{2}\right)$

54. Show that the condition for the orthogonality of the curves $ax^2 + by^2 = 1$ and $a_1x^2 + b_1y^2 = 1$ is $\frac{1}{a} - \frac{1}{b} = \frac{1}{a_1} - \frac{1}{b_1}$.

55. At any point 't' on the curve $x = a(t + \sin t), y = (1 - \cos t)$, find the length of tangent, normal, subtangent an subnormal

CONTINUITY

56. Show that $f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2} & \text{if} \quad x \neq 0 \\ \frac{1}{2}(a^2 - b^2) & \text{if} \quad x = 0 \end{cases}$ where a,b are real constants, is continuous at '0'?

57. If f is given by $f(x)=\begin{cases} k^2x-k \text{ if } x\ge 1 \\ 2 \text{ if } x<1 \end{cases}$ is continuous function on IR then find $k=?$

58. Check the continuity of f given by $f(x)=\begin{cases} \dfrac{x^2-9}{x^2-2x-3} & \text{if} \quad 0<x<5 \text{ and } x\ne 3 \\ 1.5 & \text{if} \quad x=3 \end{cases}$ at the point '3'

59. If 'f' defined by $f(x)=\begin{cases} \dfrac{\sin 2x}{x} & \text{if} \quad x\ne 0 \\ 0 & \text{if} \quad x=0 \end{cases}$ continuous at 0?

60. Check the continuity of the $f(x)$ at '2' $f(x)=\begin{cases} \dfrac{1}{2}(x^2-4) & \text{if} \quad 0<x<2 \\ 0 & \text{if} \quad x=2 \\ 2-8x^{-3} & \text{if} \quad x>2 \end{cases}$

61. Find real constant a,b so that the function f given by $f(x)=\begin{cases} \sin x & \text{if} \quad x\le 0 \\ x^2+a & \text{if} \quad 0<x<1 \\ bx+3 & \text{if} \quad 1\le x\le 3 \\ -3 & \text{if} \quad x>3 \end{cases}$ is continuous on IR

DIFFERENTIATION

62. Find the derivatives of the following functions from the first principle

i) sin2x ii) cosax iii) tan2x iv) sec3x v) $\cos^2 x$

63. If $x^y=e^{x-y}$ then show that $\dfrac{dy}{dx}=\dfrac{\log x}{(1+\log x)^2}$

64. If $y=x^y$ then show that $\dfrac{dy}{dx}=\dfrac{y^2}{x(1-\log y)}=\dfrac{y^2}{x(1-y\log x)}$

65. If $\sin y = x.\sin(a+y)$ then show that $\dfrac{dy}{dx}=\dfrac{\sin^2(a+y)}{\sin a}$

66. Find $\dfrac{dy}{dx}$ for the function $x=a(\cos t+t\sin t), y=a(\sin t-t\cos t)$

STRAIGHT LINES

67. If the straight lines $ax+by+c=0, bx+cy+a=0$ and $cx+ay+b=0$ are concurrent then prove that $a^3+b^3+c^3=3abc$

68. Find the value of k if the lines $2x-3y+k=0, 3x-4y-13=0$ and $8x-11y-33=0$ are concurrent

69. Transform the equation $\frac{x}{a}+\frac{y}{b}=1$ into the normal form. If the $\perp$ distance of straight line from the origin is p then prove that $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$

70. A straight line through $Q\left(\sqrt{3},2\right)$ makes an angle $\frac{\pi}{6}$ with positive direction of the x-axis. If the straight line intersects the line $\sqrt{3}x-4y+8=0$ at p, find the distance PQ

71. A straight line through $Q(2,3)$ makes an angle $\frac{3\pi}{4}$ with the negative direction of the x-axis. If the straight line intersects the line x+y-7=0 at p. find the distance PQ

72. Find the value of k if the angle between $4x-y+0=0$ and $kx-5y-9=0$ is 45^0

73. Find the points on the line $4x-3y-10=0$ which are at a distance of 5 units from (1,-2)

TANGENTS AND NORMALS

74. Find the equations of the tangent and normal to the curve

    i) $y=x^4-6x^3+13x^2-10x+5$ at (0,5) ii) $y=x^2-4x+2$ at (4,2)

    iii) $y=5x^4$ at (1,5)

75. Find the equations of the tangent and normal to the curve $xy=10$ at (2,5)

76. find the lengths of sub tangent, subnormal at a point t on the curve $x=a\left(\cos t+t\sin t\right), y=a\left(\sin t-t\cos t\right)$

77. Find the lengths of normal and subnormal at a point on the curve $y=\frac{a}{2}\left(e^{\frac{x}{a}}+e^{\frac{-x}{a}}\right)$

78. Show that the tangents at any point on the curve $x=c\sec\theta \lim_{\delta x\to 0}, y=c\tan\theta$ is $y\sin\theta=x-c.\cos\theta$

79. i) Show that the length of the subnormal at any point on the curve $y^2=4ax$ is a constant

    ii) Show that the length of the sub tangent at any point on the curve $y=a^x$ is a constant

SAQ's (4 Marks Questions)

LOCUS

1. Find the equation of locus of P, if the line segment joining (2,3) and (-1,5) subtends a right angle at P.
2. Find the locus of the third vertex of a right angled triangle, the ends of whose hypotenuse are

   i) (4,0) and (0,4) ii) (6,0) & (0,6).
3. A(2,3) and B(–3, 4) be two given points. Find the equation of locus of P so that area of $\triangle PAB$ is 8.5
4. A (5,3) and B (3, -2) are two fixed points. Find the equation of locus of P, so that the area of triangle PAB is 9 sq. units.
5. i) find the equation of the locus of p if the ratio of the distances from p to A(5,-4) and B97,6) is 2:3

   ii) If the distances from P to the points (2,3) and (2,-3) are in the ratio 2:3 then find the equation of the locus of P
6. A (1,2), B (2, -3) and C (-2, 3) are three points. A point 'P' moves such that $PA^2+PB^2=2PC^2$. Show that the equation to the locus P is 7x-7y+4= 0.
7. Find the equation of locus of a point P such that $PA^2 + PB^2 = 2c^2$, where $A = (a, 0)$ and $B = (-a, 0)$
8. Find the equation of locus of P, if $A = (4, 0)$, $B = (-4, 0)$ and $|PA - PB| = 4$
9. Find the equation of the locus of apoint, the difference of whose distances from (-5,0) and (5,0) is 8
10. Find the equation of locus of P, if A = (2,3), B = (2, -3) and PA + PB = 8.
11. Find the equation of the locus of a point, the sum of whose distances from (0,2) and (0,-2) is 6
12. Find the equation of locus of a point 'p' such that the distance of p from the origin is twice the distance of p from A(1,2)

STRAIGHT LINE

13. Transform the equation $\frac{x}{a}+\frac{y}{b}=1$ into the normal form when a > 0 and b >0. If the perpendicular distance of straight line from the origin is p, deduce that $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$.
14. If the straight lines ax + by +c= 0, bx +cy +a= 0 and cx +ay + b =0 are concurrent, then prove that $a^3 + b^3 + c^3 = 3abc$.
15. Find the value of k, if the lines 2x -3y + k =0, 3x -4y -13 = 0 and 8x -11y -33= 0 are concurrent.
16. A straight line through $Q\left(\sqrt{3}, 2\right)$ makes an angle $\frac{\pi}{6}$ with the positive direction of the X-axis. If the straight line intersects the line $\sqrt{3}x - 4y + 8 = 0$ at P, find the distance PQ.
17. A straight line through Q(2,3) makes an angle $\frac{3\pi}{4}$ with the negative direction of the x-axis. If the straight line intersects the line x+y-7=0 at p. find the distance PQ

18. Find the points on the line 4x -3y -10=0 which are at a distance of 5 units from the point (1, -2).

19. Find the value of k, if the angle between the straight lines 4x -y +7 =0 and kx -5y-9 =0 is 45°.

20. Transform the equation $\sqrt{3}x + y = 4$ into (a) slope - intercept form (b) intercept form and (c) normalform.

VSAQ's (2 Marks Questions)

3D-GEOMETRY

2 Marks:

1. The centroid of the triangle whose vertices are $(5,4,6),(1,-1,3)$ and $(4,3,2)$

2. If $(3,2,-1),(4,1,1)$ and $(6,2,5)$ are three vertices and $(4,2,2)$ is the centroid of a tetrahedron, find the fourth vertex.

3. Find the fourth vertex of the parallelogram whose consecutive vertices are (2,4,-1),(3,6,-1) and (4,5,1)

4. Find the ratio in which YZ-=plane dives the line joining A(2,4,5) and B(3,5,-4). Also find the point of intersection.

5. Find x if the distance between (5,-1,7) and (x,5,1) is 9 units.

6. Find the coordinates of the vertex 'C' of triangle ABC if its centroid is the origin and vertices A,B are (1,1,1) and (-2,4,1) respectively

7. For what value of t, the points (2,-1,3),(3,-5,t) and (-1,11,9) are collinear?

8. Find the ratio in which xz plane devides the line joining $A(-2,3,4)$ and $B(1,2,3)$

9. Find the centroid fo the tetrahedron whose vertices $(2,3,-4)(-3,3,-2)(-1,4,2)(3,5,1)$

10. Show that $A(1,2,3)\ B(7,0,1)C(-2,3,4)$ are collinear

11. Show that the point $(1,2,3),(2,3,1),(3,1,2)$ forms an equilateral triangle

MEAN VALUE THEOREM

12. Verify the Rolle's theorem for the function

    i) $f(x) = x^2 + 4$ in $[-3,3]$ ii) $f(x) = \sin x - \sin 2x$ on $[0,\pi]$

13. It is given that Rolle's theorem holds for the function $f(x) = x^3 + bx^2 + ax$ on $[1,3]$ with $C = 2 + \frac{1}{\sqrt{3}}$, find the values of a and b

14. Find the C so that $f^1(c) = \frac{f(b) - f(a)}{b - a}$ in teh following cases

    i) $f(x) = x^2 - 3x - 1, a = \frac{-11}{7}, b = \frac{13}{7}$ ii) $f(x) = e^x, a = 0, b = 1$

15. Verify the Rolle's theorem for the function $(x^2 - 1)(x - 2)$ on $[-1,2]$ find the point in the interval

where the dervate vanishes

16. Verify the conditions of the lagrange's mean value theorem for the following functions in each case

17. Find the point 'c' in the interval as stated by the theorem

i) x^2 on $[2,3]$ ii) $\sin x - \sin 2x$ on $[0,\pi]$

18. On the curve $y = x^2$ find A point at which the tangent is parallel to the chord joining $(0,0)$ and $(1,1)$

19. Show that there is no real number K, for for which the equation $x^2 - 3x + k = 0$ has two distinct roots in $[0,1]$

20. let $f(x) = (x-1)(x-2)(x-3)$ prove that there is more than one 'c' in $(1,3)$ such that $f^1(c) = 0$

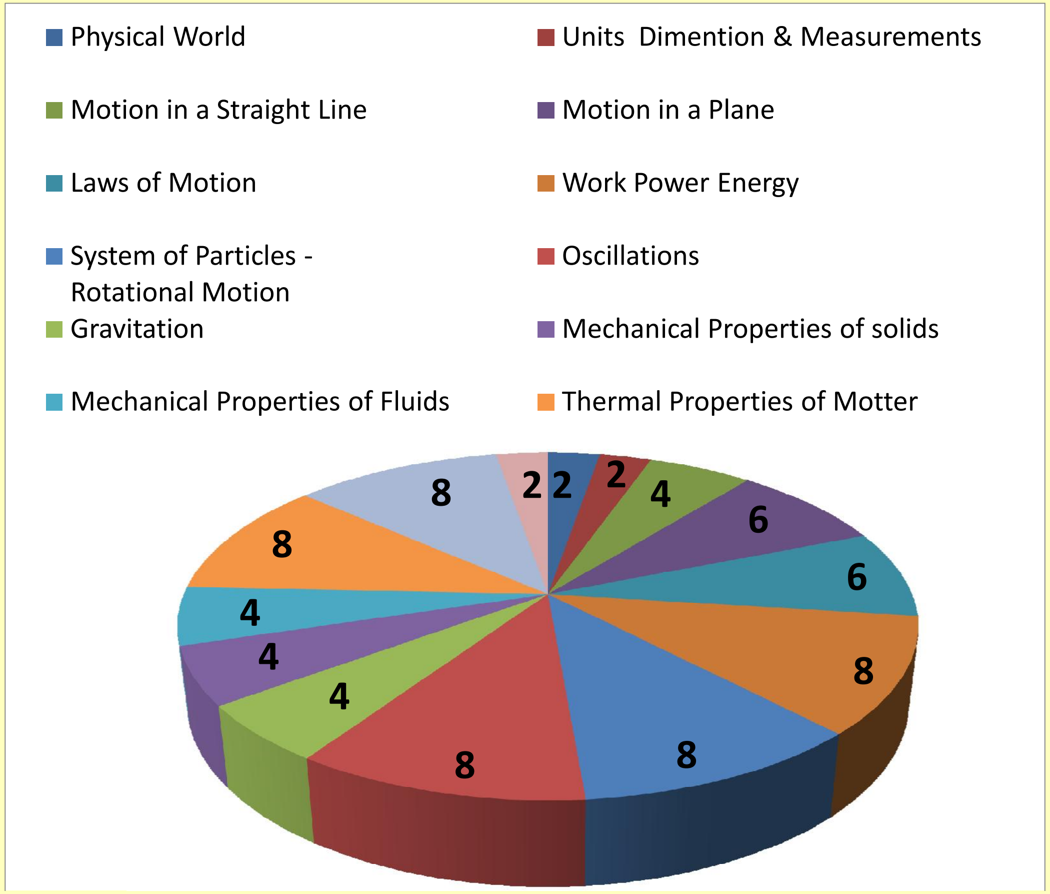
PHYSICS TOPIC WISE WEIGHTAGE

How to Score Minimum 40-50 Marks For Slow Learners

S.NO	CHAPTER NAME	NO OF QUESTIONS			
		LAQ's	SAQ's	VSAQ's	TOTAL
1	Physical World	-	-	7	**2**
2	Units Dimention & Measurements	-	-	10	**2**
3	Motion in a Straight Line	-	6	-	**4**
4	Motion in a Plane	-	6	7	**6**
5	Laws of Motion	-	6	7	**6**
6	Work Power Energy	3	-	-	**8**
7	System of Particles - Rotational Motion	-	6	-	**8**
8	Oscillations	2	-	-	**8**
9	Gravitation	-	4	-	**4**
10	Mechanical Properties of solids	-	3	-	**4**
11	Mechanical Properties of Fluids	-	-	10	**4**
12	Thermal Properties of Motter	-	4	13	**8**
13	Thermodynamics	1	-	-	**8**
14	Kinetic Theory of Gases	-	-	10	**2**
	TOTAL	6	35	64	**76**

Number of Questions Covered In these Topics

	Questions to be practice	Student can attempt (min Questions)	Student can get (Min Marks)
LAQ's	6	2	16
SAQ's	35	5	20
VSAQ's	64	7	14
Total	**105**	**14**	**50**



PHYSICS

LAQ's (8 MARKS)

WORK POWER ENERGY

1. a) State and prove law of conservation of energy in case of freely falling body

   b) A machine gun fires 360 bullets per minute and each bullet travels with a velocity of $600 ms^{-1}$, If the mass of each bullet is 5gm. Find the power of the machine gun.

   c) Calculate the power of the pump required to lift 600 kg of water per minute from a well of 25m deep.

2. Develop the motions of work and kinetic energy and show that it leads to work energy theorem.

3. What are collisions? Explain the possible types of collisions? Develop the theory of one dimensional elastic collision.

   the relative velocity of approach of two colliding bodies before collision is equal to the relative velocity of separation after collision. A body freely falling from a certain height 'h' after striking a smooth floor rebounds to a height h/2. What is coefficient of restitution between the floor and the body?

OSCILLATIONS

4. a) Show that the motion of simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum?

   The mass and radius of a plane are double that of the earth. If the time period of a simple pendulum on the earth is T. Find the time period on the planet.

   Calculate the change in the length of a simple pendulum of length 1 m, when its period of oscillation changes from 2 sec to 1.5 sec

   b) Find the length of a simple pendulum which ticks seconds. $\left(g = 9.8 ms^{-2}\right)$

5. a) Define simple harmonic motion. Show that the motion of (point) projection of a particle performing uniform circular motion, on any diameter, is simple harmonic

   b) On an average a human heart is found to beat 75 times in a minute. Calculate its frequency and period

   c) A mass of 2 kg is attached to spring of force constant $200 Nm^{-1}$. Find its time period

THERMODYNAMICS

6. State second law of thermdynamics. How is heat engine different from a refrigerator.

SAQ's (4 MARKS)

MOTION IN A STRAIGHT LINE

1. Derive the equation $x = v_0 t + \frac{1}{2}at^2$ using graphical method where the terms have usual meaning
2. Explain the terms the average velocity and instantaneous velocity. When are they equal?
3. A ball is thrown vertically upwards with a velocity of $20 ms^{-1}$ from the top of a multistorey building.

The height of the point from where the ball is thrown is 25.0 m from the ground.

a) How high will the ball rise? and (b) how long will it be before the ball hits the ground? Take g = 10 ms^{-2} (actual value is 9.8 ms^{-1})

4. A man runs across the roof of a tall building and jumps horizontally on to the (lower) roof of an adjacent building. If his speed is 9 m/s and the horizontal distance between the building is 10 m and the height difference between the roofs is 9 m, will he be able to land on the next building (Take $g=10m/s^2$)

5. A car travels the first third of a distance with a speed of 10 kmph, the second third at 20 kmph and the last third at 60 kmph. What is its mean speed over the entire distance?

6. Can the velocity of an object be in a direction other than the direction of acceleration of the object? If so, give an example.

MOTION IN A PLANE

7. State parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector.

8. Show that the trajectory of an object thrown at certain angle with the horizontal is a parabola.

9. Show that the maximum height and range of projectile are $\frac{U^2 \sin^2 \theta}{2g}$ and $\frac{U^2 \sin 2\theta}{g}$ respectively.

   Where the terms have their regular meanings.

10. Show that the maximum height reached by a projectile launched at an angle of 45^0 is one quarter of its range.

11. Define unit vector, null vector and position vector

12. If $|\bar{a} + \bar{b}| = |\bar{a} - \bar{b}|$ prove that the angle between $\vec{a}$ and $\vec{b}$ is 90^0

LAWS OF MOTION

13. State Newton's second law of motion. Hence derive the equation of motion F=ma from it
14. Mention the methods used to decrease friction
15. Explain advantages and disadvantages of friction
16. Why are shock absorbers used in motor cycles and cars?
17. Define the terms momentum and impulse. State and explain the law of conservation of linear momentum. Give examples
18. State the laws of rolling friction

SYSTEMS OF PARTICLES AND ROTATIONAL MOTION

19. Distinguish between centre of mass and centre of gravity
20. Define angular acceleration and torque. Establish the relation between angular acceleration and torque.
21. Define angular velocity (ω) . Derive $V = r\omega$
22. Find the centre of mass of three particles at the vertices of an equilateral triangle. The masses of the particles are 100 gram, 150 gram and 200 gram respectively. Each side of the equilateral triangle is 0.5 m long.
23. Find the torque of a force $7\bar{i} + 3\bar{j} - 5\bar{k}$ about the origin, the force acts on a particle whose position vector is $\bar{i} - \bar{j} + \bar{k}$

24. Find the scalar and vector products of two vectors $a = \left(3\hat{i} - 4\hat{j} + 5\hat{k}\right)$ and $b = \left(-2\hat{i} + \hat{j} - 37\hat{k}\right)$

GRAVITATION

25. What is escape velocity? Obtain an expression for it
26. What is orbital velocity? Obtain an expression for it
27. What is a geostationary satellite? State its uses.
28. State Kepler's laws of planetary motion

MECHANICAL PROPERTIES OF SOLIDS

29. Describe the behaviour of a wire under gradually increasing load.
30. Define stress and explain the types of stress.
31. Define strain and explain the types of strain.

THERMAL PROPERTIES OF MATTER

32. In what way is the anomalous behaviour of water advantageous to aquatic animals?
33. Pendulum clocks generally go fast in winter and slow in summer. Why?
34. Explain conduction, convection and radiation with examples
35. Explain Celsius and Fahrenheit scales of temperature. Obtain the relation between Celsius and Fahrenheit scales of temperatures.

VSAQ's (2 MARKS)

PHYSICAL WORLD

1. What are the fundamental forces in nature?
2. What is the discovery of C.V Raman?
3. What is the contribution of S. Chandra Sekhar to Physics?
4. Which of the following has symmetry

   a) Acceleration due to gravity b) Law of gravitation
5. What is physics?

UNITS AND MEASUREMENTS

6. Distinguish between accuracy and precision.
7. Distinguish between fundamental units and derived units.
8. What is dimensional analysis?
9. Express unified atomic mass unit in kg.
10. How can systematic errors be minimised or eliminated?
11. The velocity of a body is given by $v - At^2 - Bt + C$. If v and t are expressed in SI, what are the units of A,B and C?

    a) 6729 b) 0.024 c) 0.08240 d) 6.032 e) 4.7×10^8
12. The error in measurement of radius of a sphere is 1%. What is the error in the measurement of volume?
13. the percentage error in the mass and speed are 2% and 3% respectively. What is the maximum error in kinetic energy calculated using these quantities?
14. What are the significant numbers? Write the number of significant digits in the measurement of 0.002308.
15. Why do we have different units for the same physical quantity?

MOTION IN A PLANE

16. The vertical component of a vector is equal to its horizontal component. What is the angle made by the vector with x-axis?
17. Two forces of magnitudes 3 units and 5 units act at 60^0 with each other. What is the magnitude of their resultant?
18. When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant?
19. $A = \vec{i} + \vec{j}$. What is the angle between the vector and x-axis
20. If $\overline{p} = 266 + 4\hat{j} + 14\hat{k}$ and $\overline{Q} = 4\hat{i} + 4\hat{j} + 10\hat{k}$ find the magnitude of $\overline{P} + \overline{Q}$
21. What is the acceleration of a projectile at the top of its trajectory?
22. Wind is blowing from the south at $5ms^{-1}$. To a cyclist it appears to blowing from the east at $5ms^{-1}$. Find the velocity of the cyclist.

LAWS OF MOTION

23. What is inertia? What gives the measure of inertia?
24. When a bullet is fired from a gun, the gun gives a kick in the backward direction. Explain.
25. if a bomb at rest explodes into two pieces, the pieces must travel in opposite directions. Explain.
26. Can the coefficient of friction be greater than one?
27. Why does the car with a flattened tyre stop sooner than the one with inflated tyres?
28. A horse has to pull harder during the start of the motion than later. Explain.
29. What happens to the coefficient of friction, if the weight of the body is doubled?

MECHANICAL PROPERTIES OF FLUIDS

30. Define average pressure. Mention its units and dimensional formula
31. Define Viscosity. What are it's units and dimensions?
32. What is the principle behind the carburetor of an automobile.
33. What is magnus effect?
34. Why are drops and bubbles spherical?
35. Give the expression for the excess pressure in a liquid drop.
36. Give the expression for the excess pressure in an air bubble inside the liquid.
37. Give the expression for the soap bubble in air.
38. What are water proofing agents and water wetting agents? What do they do?
39. What is angle of contact?

THERMAL PROPERTIES OF MATTER

40. Distinguish between heat and temperature.
41. Why gaps are left between rails on a railway track?
42. Can a substance contract on heating? Give an example
43. What is latent heat of vapourisation?
44. What are the units and dimensions of specific gas constant?
45. Why utensils are coated black? Why the bottom of the utensils are made of copper?
46. State Wein's displacement law?
47. Ventilators are provided in rooms just below the roof. Why?

48. What is greenhouse effect? Explain global warning?

49. State Newton's law of cooling?

50. The roof of buildings are often painted white during summer. Why?

51. Find the increase in temperature of aluminium rod if its length is to be increased by 1%.

[α for aluminium is $25 \times 10^{-6}\ {}^{0}C^{-1}$]

52. Why is it easier to perform the skating on the snow.

53. If the maximum intensity of ration for a black body is found at 1.45μ m. What is the temperature of a radiating body(Weins constant = 2.9×10^{-3} mK)

KINETIC THEORY OF GASES

54. Define mean free path.

55. Name two prominent phenomena which provide conclusive evidence of molecular motion.

56. State Boyle's Law and Charles Law.

57. State Dalton's law of partial pressures.

58. What is the expression between pressure and kinetic energy of a gas molecule?

59. When pressure increases by 2%. What is the percentage decreases in the volume of a gas. Assuming Boyle's law is obeyed.

60. What is the law of equipartition of energy?

61. If the absolute temperature of a gas increased to 3 times, what will be the increase in RMS velocity of the gass molecule?

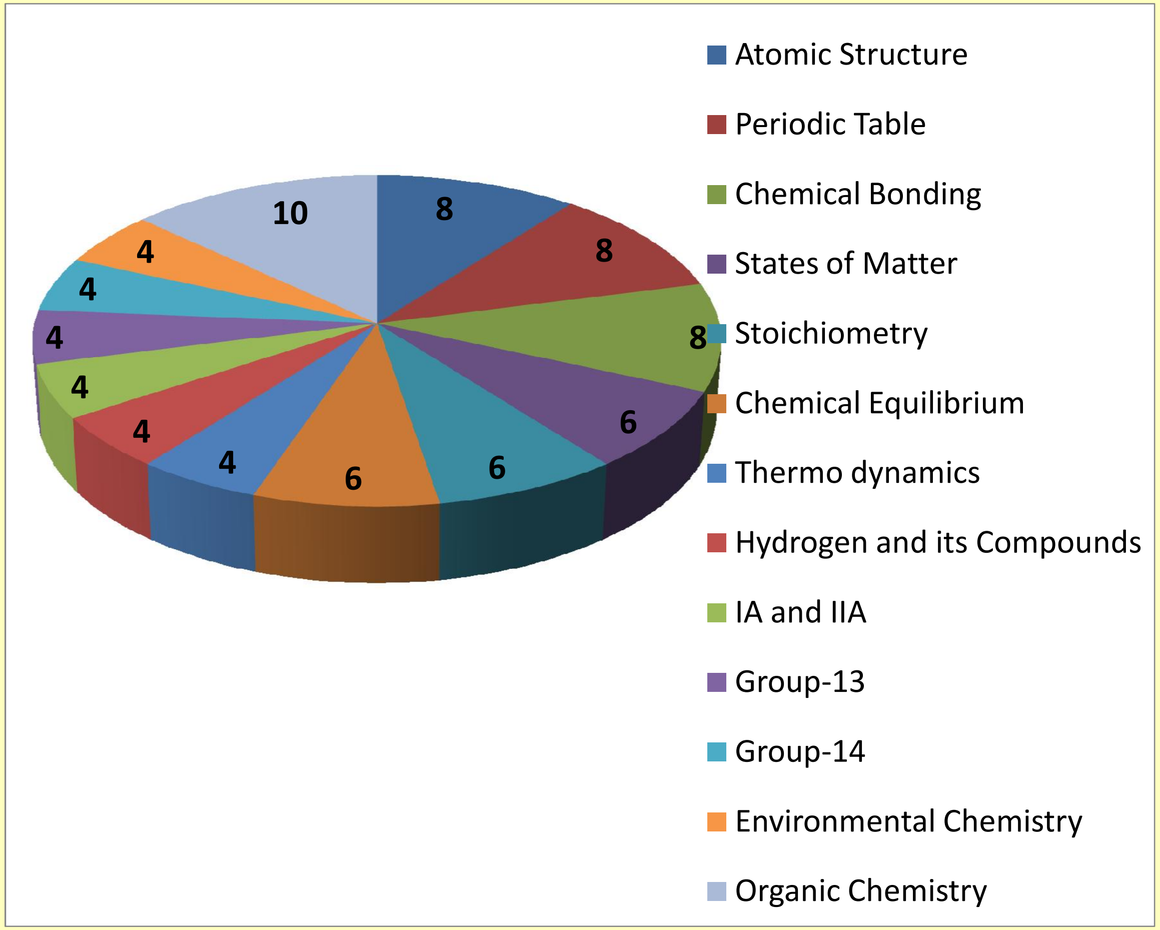
CHEMISTRY TOPIC WISE WEIGHTAGE

How to Score Minimum 40-50 Marks For Slow Learners

S.NO	CHAPTER NAME	NO OF QUESTIONS			WEIGHTAGE
		LAQ's	SAQ's	VSAQ's	
1	Atomic Structure	2	3	-	**8**
2	Periodic Table	3	2	-	**8**
3	Chemical Bonding	3	6	-	**8**
4	States of Matter	-	6	18	**6**
5	Stoichiometry	-	7	11	**6**
6	Chemical Equilibrium	-	6	4	**6**
7	Thermo dynamics	-	5	5	**4**
8	Hydrogen and its Compounds	-	5	7	**4**
9	IA and IIA	-	3	6	**4**
10	Group-13	-	3	2	**4**
11	Group-14	-	2	9	**4**
12	Environmental Chemistry	-	-	10	**4**
13	Organic Chemistry	1	2	4	**10**
	TOTAL	9	50	76	**76**

Number of Questions Covered In these Topics

	Questions to be practice	Student can attempt (min Questions)	Student can get (Min Marks)
LAQ's	9	2	16
SAQ's	50	5	20
VSAQ's	76	7	14
Total	**135**	**14**	**50**



JUNIOR CHEMISTRY IMP QUESTIONS

LAQ's (8 Marks Questions)

ATOMIC STRUCTURE

1***. How are the quantum numbers n, l and m arrived at? Explain the significance of these quantum numbers?

2***. What are the postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?

PERIODIC CLASSIFICATION

3***. Write an eassy on s, p, d and f block elements?

4***. Define IE_1 and IE_2. Why is $IE_2 > IE_1$ for a given atom? Discuss the factors that effect IE of and element?

5***. What is a periodic property? How the following properties vary in a group and in a period? Explain

(a) Atomic radius (b) IE (c) EN (d) Electron gain enthalpy. (e) Nature of oxides

CHEMICAL BONDING

6***. Give the molecular orbital energy diagram of a) N_2 and b) O_2 . Calculate the respective bond order. Write the magnetic nature of N_2 and O_2 molecule.

7**. What do you under stand by hybridization? Explain different types of hybridization involving S and P orbitals.

8*. Give an account of VSEPR Theory and it's applications?

ORGANIC CHEMISTRY

9*. Describe any two methods of preparation of benzene? Explain the halogenation, alkylation, acylation, nitration and sulphonation of benzene.

SAQ's (4 Marks Questions)

ATOMIC STRUCTURE

1*. Explain the difference between emission and absorption spectra?

2**. What are merits and limitations of Bohr's model of an atom?

3*. What is Aufbau, Hunds, Paulis exclusion principla?

PERIODIC CLASSIFICATION

4*. What is lanthanide contraction? What are it's consequences?

5*. What is diagonal relationship? Give example?

CHEMICAL BONDING

6***. State Fajan's rules and give suitable examples?

7**. Explain the hybridization involved in PCl_5 molecule?

8**. Explain the hybridization involved in SF_6 molecule.

9*. What is hydrogen bond? Explain the different types of hydrogen bonds with examples?

10*. Explain the formation of co-ordinate covalent bond with one example?

11**. Define dipole moment. Write it's applications?

STATES OF MATTER

12***. Derive Ideal gas equation.

13***. Deduce a) Boyle's law and b) Charles law from kinetic gas equation?

14***. Stat and explain Graham's law of diffusion?

15***. Deduce a) Graham's and b) Dalton's law from kinetic gas equation?

16***. Write the postulates of kinetic molecular theory of gases?

17**. State and explain Dalton's law of partial pressures.

STOICHIOMETRY

18***. Chemical analysis of a carbon compound gave the following percentage composition by weight of the elements present. Carbon = 10.06%, hydrogen = 0.84% , Chlorine = 89.10% Calculate empirical formula?

19***. Calculate the empirical formula of a compound having percentage composition k = 26.57% , Cr = 35.36% O = 38.07%

20***. A carbon compound contains 12.8% carbon, 2.1% hydrogen, 85.1% bromine. The molecular weight of the compound is 187.9 calculate molecular formula?

21***. Balance the following (reaction) redox reactions by ion electron method.

$MnO^-_{4(aq)} + SO_{2(g)} \rightarrow Mn^{+2}_{(aq)} + HSO^-_4$ (In acidic medium)

22***. Balance the following (reaction) redox reactions by ion electron method.

$Cr_2O^{2-}_{7(aq)} + SO_{2(g)} \rightarrow Cr^{+3}_{(aq)} + SO^{-2}_{4(aq)}$ (In acidic medium)

23**. Balance the following (reaction) redox reactions by ion electron method.

$MnO^-_{4(aq)} + I^-_{(aq)} \rightarrow MnO_{2(s)} + I_{2(g)}$ (In basic medium)

24**. Balance the following (reaction) redox reactions by ion electron method.

$P_4 \xrightarrow{OH^-} PH_3 + H_2PO^-_2$ (In basic medium)

CHEMICAL EQUILIBRIUM

25*. What is a conjugate acid – base pair? illustrate with examples?

26***. Discuss the application of lechatelier's principle for the industrial synthesis of ammonia and sulpher trioxide?

27***. Explain Lewis acid – base theory with suitable example?

28. Explain the concept of bronsted acids and Bronsted bases illustrate the answer with suitable examples?

29***. Derive the relation between Kp and Kc for equilibrium reaction?

30*. Define PH and Calculate the PH of

a) 10^{-3} HCl b) 10^{-3} M H_2SO_4 c) 0.001M NaOH d) 0.0008M H_2SO_4

THERMODYNAMICS

31***. State and explain the Hess's law of constant Heat summation?

32*. Define heat capacity. What are Cp and Cv ? Show that Cp – Cv = R

33**. Explain extensive and intensive properties?

34***. State the first law of thermodynamics, Explain its mathematical notion?

35**. What is entropy? Explain with example?

HYDROGEN AND ITS COMPOUNDS

36*. Explain the terms hard water and soft water? Write a note on the

i) ion – exchange method

ii) Clark's method

iii) Calgon method for the removal of hardness of water

37***. Explain with suitable examples, the following

a) Electron deficient b) Electron precise and c) Electron rich hydrides

38***. Explain the manufacturing of H_2O_2 by electrolysis using 50% H_2SO_4

39***. Write any four oxidising and four reducing properties of H_2O_2

40*. Write a few lines on the utility of Hydrogen as a fuel

IA and IIA Group Elements

41**. Givean account of biological importance of $Na^+, K^+, Ca^{+2}, Mg^{+2}$

42*. What is plaster of paris? Write a short note on it?

43*. Be shows diagonal relationship with Al. Discuss.

Group - 13

44***. What are electron deficient compounds? Is BCl_3 an electron deficient species? Explain.

45***. Explain the structure of diborane.

46***. Explain borax bead test with suitable example

Group - 14

47***. Explain the difference in properties of diamond and graphite on the basis of their structure.

48*. Explain the following

i) Inert – Pair effect ii) Allotropy iii) Catenation with example

ORGANIC CHEMISTRY

49**. What are position and functional group isomerism with example

50**. What is Geometrical isomerism and it's types

VSAQ's (2 Marks Questions)

STATES OF MATTER

1*. State Graham's law of diffusion.

2**. Which of the gases diffuses faster among N_2 , O_2 and CH_4 ? Why?

3**. How many times methane diffuses faster than sulphur dioxide?

4*. State Dalton's law of partial pressure?

5*. What is Boltzmann's constant? Give its value?

6. What is RMS speed?

7*. What is compressibility factor?

8. Give the ratio fo RMS average and most probable speed of gas molecule?

9**. What is critical temperature? Give it's value for CO_2.

10**. Why pressure cooker is used for cooking food on hills?

11*. Calculate the kinetic energy of 5 moles of Nitrogen at 27^0C?

12*. Calculate RMS velocity of CO_2 gas molecule at 27^0 C?

13. Calculate kinetic energy (in SI units) of 4g. of methane at -73^0 C?

14. Calculate kinetic energy of 2moles of Nitrogen at 27^0 C?

15. Calculate kinetic energy of 3 moles of CO_2 gas at 27^0 C?

16*. Why "R" is universal gas constant?

17**. Write the different values of R? (Universal gas constant)

18**. Write the effect of temp on surface tension and viscosity. Give reason to it?

STOICHIOMETRY

19**. How many number of moles of glucose are present in 540gm of glucose?

20*. Calculate the weight of 0.1 mole of sodium carbonate?

21**. The empirical formula of a compound is CH_2O it's molecular weight is 90. Calculate molecular formula of compound?

22**. What are disproportionation reactions? Give examples?

23*. What are comproportionation reactions? Give examples?

24. How many significant figures are present in the following

a) 0.0025 b) 208 c) 5005 d) 126000 e) 500.0 f) 2.0034

25*. Calculate the oxidation numbers of the under lines elements in the following?

a) $K\underline{mn}o_4$ b) $\underline{Cr_2}O_7^{-2}$ C) $\underline{C_6}H_{12}O_6$ d) $\underline{Cr}O_5$ e) $\underline{H_2S_2}O_8$ f) $H_2\underline{S}O_5$

26. What is oxidation state of Nitrogen in NH_4NO_3

27*. What is a redox concept ? Give example?

28. Calculate the volume of O_2 at S.T.P required to completely burn 100ml of acetylene?

29**. What do you mean by significant figures?

CHEMICAL EQUILIBRIUM

30*. Write the relation between Kp and Kc?

31**. What is meant by ionic product of water and give its value at 25^0C

32**. What is the effect of temperature on ionic product of water?

33**. What is Lewis acid? Give one example?

THERMODYNAMICS

34*. What is the relationship between Cp and Cv?

35**. State the third law of thermodynamics?

36*. What is entropy and absolute entropy and heat capacity?

37*. Define system. Give example

38*. Define lattice enthalpy

HYDROGEN AND ITS COMPOUNDS

39**. Explain the term 'SYNGAS"

40**. What do you mean by auto protolysis? Give the equation to represent the auto protolysis?

41**. What is meant by coal gasification? Explain with relevant balanced equation?

42*. Name the isotopes of hydrogen? What is the ratio of the masses of these isotopes?

43*. Mention any three uses of H_2O_2 in modern times?

44**. Write any two uses of heavy water?

45**. What is deuterolysis? Write an example?

IA and IIA Group Elements

46**. Why is Gypsum is added to cement?

47*. Write the average composition of portland cement?

48**. Why KO_2 is paramagnetic?

49**. Why are alkalimetals not found in the free state in nature?

50**. Lithium reacts with water less vigorously than sodium give your reason?

51**. Potasium carbonate cannot be prepared by solvay process. Why?

GROUP-13

52*. What is an inert pair effect?

53**. Give the formula of borazine what is its common name

GROUP-14

54**. Graphite is a good conductor – explain?

55. Write the use of ZSM – 5?

56*. How is water gas prepared

57*. How is producer gas prepared

58*. Why CO is poisonous?

59**. How does graphite function as a lubricant?

60*. SPF_6^{-2} is known while $SiCl_6^{-2}$ is not. Explain?

61**. Name any two man made silicates?

62**. Diamond is used as precious stone explain?

ENVIRONMENTAL CHEMISTRY

63**. What is chemical oxygen demand (COD) & Bio chemical oxygen (BOD)

64**. Green house effect is caused by --- and--- gases.

65*. Which oxide cause acid rain? And what is its PH value?

66*. Name two adverse effects caused by acid rains?

67. What are smoke and mist?

68. What is PAN? What effect is caused by it?

69**. Define following

A) Pollutant B) Constaminant C) Receptor D)Sink

70*. What is green house effect? And how is it caused?

71**. Name two adverse effects caused by acid rain

72**. What Agro chemicals are responsible for water pollution

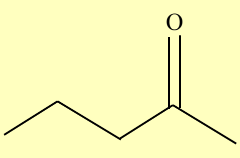
ORGANIC CHEMISTRY

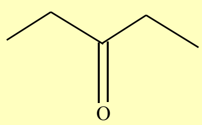
73**. What is wurtz reaction

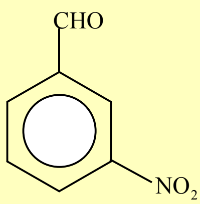
74**. How do you prepare ethyl chloride from ethylene

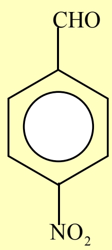
75**. Write the IUPAC names of

a) $CH_3-CH_2-CH_2-CH=CH_2$

b) 

c) 

d) 

e) 

76**. Write the structure of following compounds

1) Trichloro ethanoic acid 2) Neo pentane 3) P-nitrobenzaldehyde