SENIOR INTERMEDIATE

# IMPORTANT QUESTIONS

MATHEMATICS

PHYSICS

CHEMISTRY

MATHS - 2A TOPIC WISE WEIGHTAGE

How to Score Minimum 70 Marks by Every Student

S.NO	CHAPTER NAME	NO OF QUESTIONS			WEIGHTAGE
		LAQ's	SAQ's	VSAQ's	
1	Demovre's theorem	10	-	9	9
2	Theory of Equations	13	-	15	9
3	Binomial theorem	16	-	15	16
4	Measures of dispersion	8	-	9	9
5	Probability	15	13	-	15
6	Random variables	9	-	11	9
7	Complex Numbers	-	13	17	8
8	Quadratic Expressions	-	9	12	6
9	Permutations and Combinations	-	20	25	12
10	Partial Fractions	-	6	-	4
	TOTAL	71	61	113	97

WEIGHTAGE
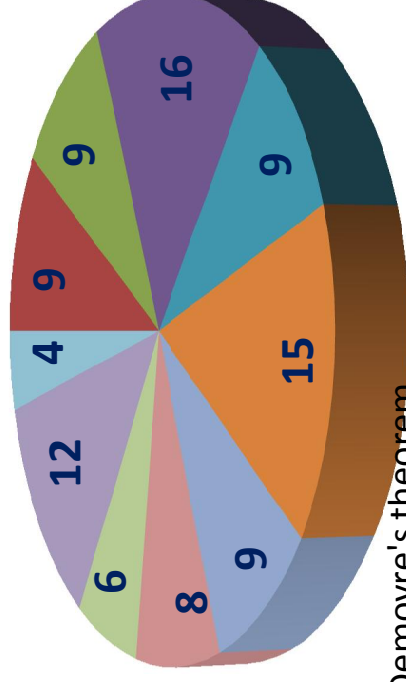
Legend:
- Demovre's theorem
- Theory of Equations
- Binomial theorem
- Measures of dispersion
- Probability
- Random variables
- Complex Numbers
- Quadratic Expressions
- Permutations and Combinations
- Partial Fractions

Pie chart values: 9, 9, 4, 12, 6, 8, 9, 15, 9, 16

MATHS-2A

LAQ's (7 Marks Questions)

DE MOIVRE'S THEOREM

1. If n is a positive integer, then Show that

   i) $(1+i)^n + (1-i)^n = 2^{\frac{n+2}{2}}.\cos\left(\dfrac{n\pi}{4}\right)$

   ii) $(1+i)^{2n} + (1-i)^{2n} = 2^{n+1}\cos\left(\dfrac{n\pi}{2}\right)$

2. ** If α, β are the roots of the equation $x^2 - 2x + 4 = 0$ then for any $n \in N$ show that

   $\alpha^n + \beta^n = 2^{n+1}\cos\left(\dfrac{n\pi}{3}\right)$

3. If n is an integer then show that

   $(1 + \cos\theta + i\sin\theta)^n + (1 + \cos\theta - i\sin\theta)^n = 2^{n+1}\cos^n\left(\dfrac{\theta}{2}\right)\cos\left(\dfrac{n\theta}{2}\right)$

4. ***Show that one value of $\left[\dfrac{1 + \sin\dfrac{\pi}{8} + i\cos\dfrac{\pi}{8}}{1 + \sin\dfrac{\pi}{8} - i\cos\dfrac{\pi}{8}}\right]^{\frac{8}{3}}$ is -1

5. **If $\cos\alpha + \cos\beta + \cos\gamma = 0\sin\alpha + \sin\beta + \sin\gamma$, prove that

   $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = \dfrac{3}{2} = \sin^2\alpha + \sin^2\beta + \sin^2\gamma$

6. ***If $\cos\alpha + \cos\beta + \cos\gamma = 0 = \sin\alpha + \sin\beta + \sin\gamma$ then show that

   i) $\cos 3\alpha + \cos 3\beta + \cos 3\gamma = 3\cos(\alpha + \beta + \gamma)$

   ii) $\sin 3\alpha + \sin 3\beta + \sin 3\gamma = 3\sin(\alpha + \beta + \gamma)$

   iii) $\cos(\alpha + \beta) + \cos(\beta + \gamma) + \cos(\gamma + \alpha) = 0$

7. ***If n is a positive integer, show that $(P + iQ)^{\frac{1}{n}} + (P - iQ)^{\frac{1}{n}} = 2(P^2 + Q^2)^{\frac{1}{2n}}.\cos\left[\dfrac{1}{n}\tan^{-1}\dfrac{Q}{P}\right]$.

8. If n is an integer and $z = c\,is\,\theta, \left(\theta \neq (2n+1)\dfrac{\pi}{2}\right)$ then show that $\dfrac{z^{2n} - 1}{z^{2n} + 1} = i\tan n\theta$

9.***If m, n are integers and $x = \cos\alpha + i\sin\alpha$, $y = \cos\beta + i\sin\beta$ then prove that

$$x^m y^n + \frac{1}{x^m y^n} = \cos(m\alpha + n\beta) \text{ and } x^m y^n - \frac{1}{x^m y^n} = 2i\sin(m\alpha + n\beta)$$

10.***Find all the roots of the equation

i) $x^{11} - x^7 + x^4 - 1 = 0$

ii) $x^9 - x^5 + x^4 - 1 = 0$

THEORY OF EQUATIONS

11.***Solve i) $6x^6 - 25x^5 + 31x^4 - 31x^2 + 25x - 6 = 0$ ii) $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$

12.   Solve i) $6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$ ii) $x^5 - 5x^4 + 9x^3 - 9x^2 + 5x - 1 = 0$

13.   i) Solve the equation $x^3 - 7x^2 + 14x - 8 = 0$, given that the roots are in G.P.

ii) Solve the equation $x^3 - 3x^2 - 6x + 8 = 0$, given that the roots are in A.P.

14.***Solve $18x^3 + 81x^2 + 121x + 60 = 0$, given that one root is equal to half the sum of the remaining roots.

15.   Solve that equation $x^4 - 6x^3 + 13x^2 - 24x + 36 = 0$, given that they have multiple roots.

16.***Given that the roots of $x^3 + 3px^2 + 3qx + r = 0$ are in

i) A.P show that $2p^3 - 3qp + r = 0$ ii) G.P show that $p^3 r = q^3$

iii) H.P show that $2q^3 = r(3pq - r)$

17.   Solve $x^4 + 4x^3 - 2x^2 - 12x + 9 = 0$, given that it has two pairs of equal roots

18.   Solve $8x^4 - 2x^3 - 27x^2 + 6x + 9 = 0$ given that two roots have that same absolute value, but are oposite in sign

19.   Solve $2x^3 + 3x^2 - 8x + 3 = 0$ one root being double the another root.

20.   Find the roots of $x^4 - 16x^3 + 86x^2 - 176x + 105 = 0$

21.**Solve the equation $x^4 + x^3 - 16x^2 - 4x + 48 = 0$, the product of two of the roots being 6.

22.**Find the polynomial equation whose roots are the translate of the roots of $x^5 + 4x^3 - x^2 + 11 = 0$ by '-3'

23.   Solve $x^4 - 4x^2 + 8x + 35 = 0$ given that $2 + i\sqrt{3}$ is a root

BINOMIAL THEOREM

24.***If the 2nd, 3rd and 4th terms in the expansion of $(a + x)^n$ are respectively, 240, 720, 1080 find a, x, n.

25.   If 36, 84, 126 are three successive binomial coefficients in the expansion of $(1+x)^n$, then find n.

26.***If the coefficients of rth, $(r + 1)$th and $(r + 2)$nd terms in the expansion of $(1 + x)^n$ are in A.P then show that $n^2 - (4r + 1)n + 4r^2 - 2 = 0$

27. If P and Q are the sum of odd terms and the sum of even terms respectively in the expansion of $(x+a)^n$ then prove that $\quad$ i) $P^2 - Q^2 = (x^2 - a^2)^n$ $\qquad$ ii) $4PQ = (x+a)^{2n} - (x-a)^{2n}$

28.** If the coefficients of 4 consecutive terms in the expansion of $(1+x)^n$ are a_1, a_2, a_3, a_4 respectively.

Then show that $\dfrac{a_1}{a_1 + a_2} + \dfrac{a_3}{a_3 + a_4} = \dfrac{2a_2}{a_2 + a_3}$

29.*** If the coefficient of x^{10} in the expansion of $\left(ax^2 + \dfrac{1}{bx} \right)^{11}$ is equal to the coefficient of x^{-10} in the

expansion of $\left(ax - \dfrac{1}{bx^2} \right)^{11}$ find the relation between a and b, when a and b are real numbers.

30.** Supose that n is natural number and I, F are integral part and fractional part of $\left(7 + 4\sqrt{3} \right)^n$

then show that i) I is odd integer $\qquad$ ii) $(I+F)(1-F) = 1$

31.*** i) If 'n' is a positive integer and 'x' is any non zero real number, then prove that

$$c_0 + c_1 \dfrac{x}{2} + c_2 \dfrac{x^2}{3} + c_3 \dfrac{x^3}{4} + \ldots\ldots + c_n \dfrac{x^n}{n+1} = \dfrac{(1+x)^{n+1} - 1}{(n+1)x}$$

ii) If n is a positive integer, then prove that $C_0 + \dfrac{C_1}{2} + \dfrac{C_2}{3} + \ldots + \dfrac{C_n}{n+1} = \dfrac{2^{n+1} - 1}{n+1}$

32.*** If C_r denotes ^nC_r then $C_0 C_r + C_1 C_{r+1} + C_2 C_{r+2} \ldots\ldots C_{n-r} . C_n = {}^{2n}C_{n+r} = \dfrac{(2n)!}{(n-r)!(n+r)!}$ and

hence deduce that $\quad$ i) $C_0^2 + C_1^2 + C_2^2 + \ldots + C_n^2 = {}^{2n}C_n$

ii) $C_0 . C_1 + C_1 . C_2 + C_2 . C_3 + \ldots + C_{n-1} . C_n = {}^{2n}C_{n+1}$

33.*** Find the sum of the infinite series $\quad$ i) $\dfrac{3}{4} + \dfrac{3.5}{4.8} + \dfrac{3.5.7}{4.8.12} + \ldots$ $\qquad$ ii) $1 - \dfrac{4}{5} + \dfrac{4.7}{5.10} - \dfrac{4.7.10}{5.10.15} + \ldots$

iii) $\dfrac{3}{4.8} - \dfrac{3.5}{4.8.12} + \dfrac{3.5.7}{4.8.12.16} - \ldots$ $\qquad$ iv) $\dfrac{3.5}{5.10} + \dfrac{3.5.7}{5.10.15} + \dfrac{3.5.7.9}{5.10.15.20} + \ldots\ldots$

34. If $x = \dfrac{1.3}{3.6} + \dfrac{1.3.5}{3.6.9} + \dfrac{1.3.5.7}{3.6.9.12} + \ldots\ldots\ldots$ then prove that $9x^2 + 24x = 11$

35.*** If $x = \dfrac{1}{5} + \dfrac{1.3}{5.10} + \dfrac{1.3.5}{5.10.15} + \ldots\infty$, then find $3x^2 + 6x$

36.*** Find the sum of the infinite series $\dfrac{7}{5}\left(1 + \dfrac{1}{10^2} + \dfrac{1.3}{1.2}\left(\dfrac{1}{10^4}\right) + \dfrac{1.3.5}{1.2.3}\left(\dfrac{1}{10^6}\right) + \ldots\ldots \right)$

37. ***If $x = \dfrac{5}{(2!).3} + \dfrac{5.7}{(3!).3^2} + \dfrac{5.7.9}{(4!).3^3} + \cdots$, then find the value of $x^2 + 4x$

38. If the coefficients of x^9, x^{10}, x^{11} in the expansion of $(1+x)^n$ are in A.P then prove that
   $n^2 - 41n + 398 = 0$

MEASURES OF DISPERSION

39. ***Calculate the variance and standard deviation of the following continuous frequency distribution.

Class intervel	30-40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	3	7	12	15	8	3	2

40. ***The scores of two cricketers A and B in 10 innings are given below. Find who is a better run getter and who is more consistent player.

Scores of A : x_i	40	25	19	80	38	8	67	121	66	76
Scores of B : y_i	28	70	31	0	14	111	66	31	25	4

41. ***Find the mean and variance using step deviation method, of the following tabular data, giving the age distribution of 542 members.

Age in years (x_i)	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Number of (f_i) members	3	61	132	153	140	51	2

42. ***From the prices of shares X and Y given below, for 10 days of trading, find out which share is more stable

X	35	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

43. ** The arithmetic mean and standard deviation of a set of 9 items are 43 and 5 respectively. If an item of value 63 is added to that set, find the new mean and standard deviation of 10 item set given.

44. Find the mean deviation about the median for the following continuous distribution.

Marks obtained	0-10	10-20	20-30	30-40	40-50	50-60
No.of boys	6	8	14	16	4	2

45.** Find the mean deviation about the mean for the following continuous distribution.

Height (in cms)	95-105	105-115	115-125	125-135	135-145	145-155
Number of boys	9	13	26	30	12	10

46.** Find the variance and standard deviation of the following frequency distribution

x_i	6	10	14	18	24	28	30
y_i	2	4	7	12	8	4	3

PROBABILITY

47.***State and prove addition theorem on probability

48.***Define conditional probability. State and prove multiplication theorem on probability.

49.***State and prove Baye's theorem.

50.***Define conditinal probility. Bag B_1 contains 4 white and 2 black balls. Bag B_2 contains 3 white and 4 black balls. A bag is drawn at random and a ball is chosen at random from it. What is the probability that the ball drawn is white?

51. There are 3 black and 4 white balls in one bag. 4 black and 3 white in the second bag. A die is rolled and the first bag is selected if it is 1 or 3, and the second bag for the rest. Find the probability of drawing a black ball from the selected bag.

52.*** Three boxes B_1, B_2 and B_3 contain balls with different colours as shown below.

Box	White	Black	Red
I	2	1	2
II	3	2	4
III	4	3	2

A die is thrown, B_1 is chosen if either 1 or 2 turns up. B_2 is chosen if 3 (or) 4 turns up and B_3 ischosen if 5 (or) 6 turns up.   Having choosen a box in this way, a ball is choosen at random from this box. If the ball drawn is found to be red, find the probability that it is from box B_2

53.***Three boxes numbered I, II, III contain the balls as follows.

Box	White	Black	Red
I	1	2	3
II	2	1	1
III	4	5	3

One box is randomly selected and a ball is drawn from it. If the ball is red then find the probability that is from box II.

54.** If one ticket is randomly selected from the tickets numbered 1 to 30, then find the probability that the number on the tickets is   i) a multiple of 5 or 7   ii) a multiple of 3 or 5

55.*** In a box contaning 15 bulbs, 5 are defective. If 5 bulbs are selected at random from the box. Find the probalility of the event that

i) none of them is defective   ii) only one of them is defective   iii) atleast one of them is defective

56. In an experiment of drawing a card at random from a pack, the event of getting a spade is denoted by A and getting a picured card (king, queen or jack) is denoted by B. Find the probabilities of A, B, $A \cap B, A \cup B$.

57.** Two persons A and B are rolling a die on the condition that the persons who gets 3 first will win the game. If A starts the game, then find the probabilities of A and B respectively to win the game.

58. A, B, C are 3 news papers from a city. 20% of the population read A, 16% read B, 14% read C, 8% both A and B, 5 % both A and C, 4% both B and C and 2% all the three. Find the percentage of the population who read atleast one news paper.

59. If A, B, C are three independent events of an experiment such that

$$P\left(A \cap B^c \cap C^c\right) = \frac{1}{4}, P\left(A^c \cap B \cap C^c\right) = \frac{1}{8}, P\left(A^c \cap B^c \cap C^c\right) = \frac{1}{4}, \text{ then find } P(A), P(B)$$

and P(C)

60. In a shooting test the probability of A, B, C hitting the targets are $\frac{1}{2}, \frac{2}{3}$ and $\frac{3}{4}$ respectively. If all of them fire at the same target, find the probability that i) only one of them hits the target

ii) atleast one of them hits the target.

61.*** A, B, C are aiming to shoot a balloon, A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that of C is 2 out of 3. If the three aim the balloon simultaneously, then find the probability that atleast two of them hit the balloon.

RANDOM VARIABLES AND PROBABILITY DISTRBUTIONS

62***. The range of random variable X is {0, 1, 2} given that

$P(X = 0) = 3c^3$, $P(X = 1) = 4c - 10c^2$, $P(X = 2) = 5c - 1$

i) find the value of c   ii) $P(X < 1), P(1 < X \leq 2)$ and $P(0 < X \leq 3)$

63***. A random variable X has the following probability distribution

X = x	0	1	2	3	4	5	6	7
P (X = x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

find i) k value   ii) the means of X and   iii) p(0<X<5)

64***. A random variable X has the following probability distribution. Find 'k', mean, variance of X.

X = x_i	– 2	– 1	0	1	2	3
P(X = x_i)	0.1	k	0.2	2k	0.3	k

65. The P.d of Random variable X is

X = x_i	1	2	3	4	5
P(X = x_i)	k	2k	3k	4k	5k

66***. In the experiment of tossing a con n times, if the variable X, denotes the number of heads and P (X = 4), P(X = 5) and P (X = 6) are in A.P find 'n'

67**. One in 9 ships is likely to be wrecked when they are set on sail. when 6 ships are on sail. Find the probability for   i) atleast one will arrive safely   ii) exactly three will arrive safely

68. The range of a random variable X is {1, 2, 3,....} and $P(X = k) = \dfrac{c^k}{k!}$; $(k = 1, 2, 3,....)$. Find the value of c and P(0<X<3)

69**. If X is random variable with probability distrubition. $P(X = k) = \dfrac{(k+1)C}{2^k}$, $k = 0, 1, 2....$ then find C.

70. A cubical die is thrown. Find the mean and variance of X, giving the number on the face that shows up.

SAQ's (4 Marks Questions)
COMPLEX NUMBERS

1. If z = x + iy and if the point P in the Argand plane represents z, then described geometrically the locus of z satisying the equations

   i) $|z - 2 - 3i| = 5$ ii) $2|z - 2| = |z - 1|$ iii) Img $z^2 = 4$ iv) $\text{Arg}\left(\dfrac{z-1}{z+1}\right) = \dfrac{\pi}{4}$

2. Show that the points in the Argand diagram represented by the complex numbers 2 + 2i, –2 – 2i, $-2\sqrt{3} + 2\sqrt{3}i$ are the vertices of an equilateral triangle.

3.*** Show that the four points in the Argand plane represented by the complex numbers 2 + i, 4 + 3i, 2 + 5i, 3i are the vertices of a square.

4.*** Show that the points in the Argand plane represented by the complex numbers

   $-2 + 7i, \dfrac{-3}{2} + \dfrac{1}{2}i, 4 - 3i, \dfrac{7}{2}(1 + i)$ are the vertices of a rhombus.

5. The points P, Q denote the complex numbers, z_1, z_2 in the Argand diagram O is the origin. If $z_1\bar{z}_2 + \bar{z}_1 z_2 = 0$, then show that $\lfloor POQ = 90^0$.

6. The point P represent a complex number z in the Argand plane. If the amplitude.of z is $\dfrac{\pi}{4}$, determine the locus of P.

7. If the point P denotes the complex number $z = x + iy$ in the Argand plane and if $\dfrac{z-i}{z-1}$ is a purely imaginary number. Find the locus of P.

8. If the amplitude of $\left(\dfrac{z-2}{z-6i}\right) = \dfrac{\pi}{2}$, find its locus

9. If $z = x + iy$ and $|z| = 1$, then find the locus of z.

10. If $|z - 3 + i| = 4$, determine the locus of z.

11. If $z = 3 - 5i$, then show $z^3 - 10z^2 + 58z - 136 = 0$

12. i) $x + iy = \dfrac{1}{1 + \cos\theta + i\sin\theta}$, Show that $4x^2 - 1 = 0$

    ii) $x + iy = \dfrac{3}{2 + \cos\theta + i\sin\theta}$, Show that $x^2 + y^2 = 4x - 3$

13. if $z = 3 - 4i$, then show that $z^3 - 10z^2 + 58z - 136 = 0$

QUADRATIC EXPRESSIONS AND EQUATIONS

14. **If 'x' is real, show that the value of the expression $\dfrac{x^2 + 34x - 71}{x^2 + 2x - 7}$ do not lie between 5 and 9

15. Prove that $\dfrac{1}{3x+1} + \dfrac{1}{x+1} - \dfrac{1}{(3x+1)(x+1)}$ does not lie between 1 and 4, if 'x' is real

16. ***If 'x' is real, prove that $\dfrac{x}{x^2 - 5x + 9}$ lies between $\dfrac{-1}{11}$ and 1.

17. ***If the expression $\dfrac{x-p}{x^2 - 3x + 2}$ takes all real values for $x \in R$ then find the limits for 'p'

18. If 'x' real, find the maximum and minimum values of the expression $\dfrac{x^2 + 14x + 9}{x^2 + 2x + 3}$

19. Find the range of the following expression if $x \in R$

    ***i) $\dfrac{x+2}{2x^2 + 3x + 6}$ ii) $\dfrac{2x^2 - 6x + 5}{x^2 - 3x + 2}$ ***iii) $\dfrac{x^2 + x + 1}{x^2 - x + 1}$

20. Let a,b, c $\in R$ and $a \neq 0$. Then the roots of $ax^2 + bx + c = 0$ are non-real complex numbers if and only if $ax^2 + bx + c$ and a have the same sign for all $x \in R$.

21. Let a, b, c $\in$ R and $a \neq 0$ such that the equation $ax^2 + bx + c = 0$ has real roots α and β with $\alpha < \beta$ then.

i) for $\alpha < x < \beta$, $ax^2 + bx + c$ and a have opposite signs

ii) for $x < \alpha$ or $x > \beta$, $ax^2 + bx + c$ and a have the same sign.

22. ***If $c^2 \neq ab$ and the roots of $(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$ are equal then show that $a^3 + b^3 + c^3 = 3abc$ (or) a = 0

PERMUTATIONS & COMBINATIONS

23. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in the dictionary order. Then find the rank of the word

i) REMAST ***ii) MASTER

24. If the letters of word PRISON are permuted in all possible ways and the word thus formed are arranged in dictionary order. Then find the rank of the word i) SIPRON ***ii) PRISON

25.** If the letters of the word EAMCET are permuted in all possible ways and if the words thus formed are aranged in dictionary order find the rank of word EAMCET

26. Find the number of ways of arranging 6 boys and 6 girls in a row. In how many of these arrangements.

i) all the girls are together   ii) no two girls are together   iii) boys and girls come alternately

27. Find the sum of all 4–digit numbers that can be formed using the digits

** i) 1,3,5,7,9   ii) 1,2,4,5,6   iii) 0,2,4,7,8 without repetition

28.** Find the number of numbers that are greater than 4000 which can be formed using the digits 0,2,4,6,8 without repetition.

29. Find the number of ways of permuting the letters of the word 'PICTURE' so that

i) all vowels come together   ii) no two vowels come together

30.** Find the number of ways of seating 5 Indians, 4 Americans and 3 Russians at a round table so that
i) all Indians are sit together   ii) No two Russians sit together iii) persons of same nationality sit together

31.**Find the number of wasy of arranging 6 red roses and 3 yellow roses of different sizes into a garland. In how many of them   i) all the yellow roses are together   ii) no two yellow roses are together

32.***Find the number of 4 letter words that can be formed using the letters of the word 'RAMANA'

33. Find the numberof ways of formaing a committee of 5 members out 6 Indians and 5 Americans so that always the Indians will be majority in the committee

34. Find the number of ways of forming a committee of 5 persons from a group of 5 Indians, 4 Russians such that there are atleast 3 Indians in the committee.

35.***Find the number of ways of selecting a cricket team of 11 players from 7 bats men and 6 bowlers such that three will be atleast 5 bowlers

36. ***Find the number of ways of selecting a cricket team of 11 players from 7 bats men and 6 bowlers and 2 wicket keepers such that the team contains atleast 4 bowlers and 2 wicket keepers.

37. Simplify **i) $^{34}C_5 + \sum_{r=0}^{4}(38-r)_{C_4}$ ii) $^{25}C_4 + \sum_{r=0}^{4}(29-r)_{C_3}$

38. Find the number of ways of selecting 11 member cricket team from 7 batsman and 6 bowlers and 2 wicket keepers so that team contains atleast 4 bowlers and 2 wiket keepers

39. ***Prove that $\dfrac{^{4n}C_{2n}}{^{2n}C_n} = \dfrac{1.3.5.......(4n-1)}{\{1.3.5......(2n-1)\}^2}$

40. **If the letters of the word BRING are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the 59th word.

41. There are 9 objects and 9 boxes. Out of 9 objects, 5 cannot fit in three small boxes. How many arrangements can be made such that each object can be put in one box only.

42. ***If the letters of the word AJANTA are permuted in all possible ways and the words thus formed are arranged in dictorary order, find the ranks of the words i) AJANTA   ii) JANATA

PARTIAL FRACTIONS

Resolve the following fractions into partial fractions

43. ***i) $\dfrac{3x^3 - 8x^2 + 10}{(x-1)^4}$.   ii) $\dfrac{x^2 + 5x + 7}{(x-3)^3}$

44. i) $\dfrac{x-1}{(x+1)(x-2)^2}$ ***ii) $\dfrac{x^2 + 13x + 15}{(2x+3)(x+3)^2}$ iii) $\dfrac{3x-18}{x^3(x+3)}$

45. i) $\dfrac{x^2 - 3}{(x+2)(x^2+1)}$ ii) $\dfrac{2x^2 + 3x + 4}{(x-1)(x^2+2)}$ iii) $\dfrac{x^2+1}{(x^2+x+1)^2}$

46. i) $\dfrac{x^3}{(2x-1)(x+2)(x-3)}$ *** ii) $\dfrac{x^3}{(x-a)(x-b)(x-c)}$

47. ***i) $\dfrac{x^4}{(x-1)(x-2)}$ ii) $\dfrac{x^3}{(x-1)(x+2)}$

48. Find the coefficient of x^n in the power series expansions of $\dfrac{x-4}{x^2-5x+6}$ specifying the region in which the expansion is valid.

PROBABILITY

49. If two numbers are selected randomly from 20 consecutive natural numbers, find the probability that the sum of the two numbers is i) an even number   ii) an odd number

50. ***The probability for a contractor to get a road contract is $\dfrac{2}{3}$ and to get a building contract is $\dfrac{5}{9}$. The probability to get atleast one contract is 4/5. Find the probability that the gets both the contracts.

51. ***A bag contains 12 two rupee coins, 7 one rupee coins and 4 half a rupee coins. If three coins are selected at random then find the probability that

i) the sum of three coins is maximum   ii) the sum of three coins is minimum

iii) each coin is of different value

52. ** A and B are seeking admission into IIT. If the probability for A to be selected is 0.5 and that both to be selected is 0.3, then is it possible that, the probability of B to be selected is 0.9?

53. A, B, C are three horses in a race. The probability of A to win the race is twice that of B, and probability of B is twice that of C. What are the probabilities of A, B and C to win the race.

54. ***The probabilities of three events A, B, C are such that P (A) = 0.3, P (B) = 0.4, P(C) = 0.8, $P(A \cap B) = 0.08$, $P(A \cap C) = 0.28$, $P(A \cap B \cap C) = 0.09$ and $P(A \cup B \cup C) \geq 0.75$ show that $P(B \cap C)$ lies in the interval $[0.23, 0.48]$.

55. a) If A and B are independent events with P(A) = 0.2. P(B) = 0.5, then find

i) P(A/B)   ii) P(B/A)   iii) P(A $\cap$ B)   iv) P(A $\cup$ B)   v) P(A^c $\cap$ B^c)

b) If A and B are independent events with P(A) = 0.6. P(B) = 0.7, then find

i) P(A $\cap$ B)   ii) P(A $\cup$ B)   iii) P(B/A)   iv) P(A^c $\cap$ B^c)

56. ***A problem in calculus is given to two students A and B whose chances of solving it are $\dfrac{1}{3}$ and $\dfrac{1}{4}$. Find the probability of the problem being solved if both of them try independently.

57. ***A speaks truth in 75% of the cases and B in 80% cases. What is the probability that their statements about an incident do not match

58. ** The probability that a boy A will get a scholarship is 0.9 and that another boy B will get is 0.8. What is the probability that atleast one of them will get the scholarship?

59. ** The probability that Australia wins a match against India in a cricket game is given to be 1/3. If India and Australia play 3 matches what is the probability that

i) Australia will loose all the 3 matches   ii) Australia will win atleast one match.

60. A and B are events with P(A) = 0.5, P(B)=0.4 and P(A $\cap$ B) = 0.3. Find the probability that

i) A does not occur ii) neither A nor B occurs.

61** . If A and B are two events with P($A \cup B$) = 0.65, P($A \cap B$) = 0.15. Then find the value of

P($\overline{A}$) + ($\overline{B}$).

COMPLEX NUMBERS

1. ***Write the multiplicative inverse of the following complex numbers

   i) $(\sin\theta, \cos\theta)$ ii) $(7, 24)$

2. Find the square roots of $(-5 + 12i)$

3. ***Show that $Z_1 = \dfrac{2+11i}{25}, Z_2 = \dfrac{-2+i}{(1-2i)^2}$ are conjugate to each other.

4. Write the conjugate of the following complex numbers.

   i) $(2 + 5i)(-4 + 6i)$

5. Find a square root for the following complex numbers

   i) $7 + 24i$ **ii) $-47 + i.8\sqrt{3}$ iii) $3+4i$

6. If $(a + ib)^2 = x + iy$, find $x^2 + y^2$

7. ***Show that $\dfrac{2-i}{(1-2i)^2}$ and $\dfrac{-2-11i}{25}$ are conjugate to each other.

8. Find the least positive integer n, satisfying $\left(\dfrac{1+i}{1-i}\right)^n = 1$

9. ***Find the real values of θ in order that $\dfrac{3+2i\sin\theta}{1-2i\sin\theta}$ is a ————

10. Express $-1-i$ in polar form with principal value of the amplitude

11. If $z_1 = -1$ and $z_2 = -i$, then find Arg $(z_1 z_2)$

12. If $z_1 = -1$ and $z_2 = i$, then find Arg $\left(\dfrac{z_1}{z_2}\right)$

13. If $\dfrac{z_2}{z_1}, z_1 \neq 0$, is an imaginary number then find the value of $\left|\dfrac{2z_1+z_2}{2z_1-z_2}\right|$

14. ***If $\left(\sqrt{3}+i\right)^{100} = 2^{99}(a+ib)$, then show that $a^2 + b^2 = 4$

15. ***If the Arg $\overline{z_1}$ and Arg z_2 are $\dfrac{\pi}{5}$ and $\dfrac{\pi}{3}$ respectively, then find $\left(\text{Arg}z_1 + \text{Arg}z_2\right)$

16. If $(1-i)(2-i)(3-i)........(1-ni) = x - iy$, then prove that $2.5.10..... (1+n^2) = x^2 + y^2$

17. If $|z+ai| = |z-ai|$, then find the locus of z.

DE MOIVRE'S THEOREM

18.   Find the values of the following

   i) $(1+i)^{16}$ ii) $\left(1+i\sqrt{3}\right)^3$ iii) $(1-i)^8$ iv) $\left(\dfrac{\sqrt{3}}{2}+\dfrac{i}{2}\right)^5 - \left(\dfrac{\sqrt{3}}{2}-\dfrac{i}{2}\right)^5$

19.   Find all the values of

   i) $\left(1-i\sqrt{3}\right)^{1/3}$ **ii) $(-16)^{1/4}$

20**. If ABC are angles of a triangle such that x = cis A, y = cis B, z = cis C, then find the values of xyz.

21.   Find the cube roots of 8.

22.   If $1, \omega, \omega^2$ are the cube roots of unity, then prove that

   i) $\left(2-\omega\right)\left(2-\omega^2\right)\left(2-\omega^{10}\right)\left(2-\omega^{11}\right) = 49$

   ii) Show that $\dfrac{1}{2+w} + \dfrac{1}{1+2w} = \dfrac{1}{1+w}$

23.   i) $Z = \left(\cos\theta, \sin\theta\right)$ then find $z - \dfrac{1}{z}$

   ii) If $x = \text{cis}\theta$, find the value of $x^6 + \dfrac{1}{x^6}$

24.   If $1, \omega, \omega^2$ are the cube roots of unity, prove that

   i) Find $\left(1-\omega+\omega^2\right)^3$

   ii) $\left(1-\omega+\omega^2\right)^5 + \left(1+\omega-\omega^2\right)^5$

25.   If α, β are the roots of the equation $x^2 + x + 1 = 0$ then prove that $\alpha^4 + \beta^4 + \alpha^{-1}\beta^{-1} = 0$

26.   Find all the value of $\left(\sqrt{3}+i\right)^{1/4}$

QUADRATIC EXPRESSIONS AND EQUATIONS

27.***If the equation $x^2-15-m(2x-8)=0$ has equal roots find the value of m.

28.   If $(m+1)x^2 + 2(m+3)x + (m+8) = 0$ has equal roots, find m.

29.   If α, β are the roots of $ax^2 + bx + c = 0$ then find the value of

   i) $\dfrac{1}{\alpha^2} + \dfrac{1}{\beta^2}$ ii) $\alpha^4\beta^7 + \alpha^7\beta^4$ iii) $\dfrac{\alpha^2+\beta^2}{\alpha^{-2}+\beta^{-2}}$ iv) $\dfrac{\alpha}{\beta^2} + \dfrac{\beta}{\alpha^2}$

30.   Find the quadratic equation whose roots are i) $-3\pm 5i$ ii) $7\pm 2\sqrt{5}$

31.   Find the Quadratic equation whose roots are i) $\dfrac{p-q}{p+q}, \dfrac{-(p+q)}{p-q}$ $(p \neq \pm q)$ ii) $\dfrac{m}{n}, -\dfrac{n}{m}$

32. Find the quadratic equation the sum of whose roots is one and sum of the squares of the roots is 13.

33. ***If $x^2 + bx + c = 0$ and $x^2 + cx + b = 0(b \neq c)$ have a common root, then show that b+c+1=0

34. i) If $x^2-6x+5 = 0$ and $x^2 - 3ax + 35 = 0$ have a common root then find 'a'.

   ***ii) If $x^2-6x+5 = 0$ and $x^2 - 12x + p = 0$ have a common root then find 'p'.

35. Find the changes in the sign of the expression $15+4x-3x^2$ and find their extreme values

36. ***Find the maximum or minimum value of the quadratic expression i) $2x-7-5x^2$ ii) $3x^2+2x+11$

37. Prove that the roots of $(x-a)(x-b) = h^2$ are always real.

38. If the equation $x^2 + ax + b = 0$ and $x^2 + cx + d = 0$ have a common root and first equation has equal roots then prove that 2(b+d)=ac

THEORY OF EQUATIONS

39. If α, β, 1 are the roots of $x^3 -2x^2 -5x+6=0$, then find $\alpha \& \beta$

40. If 1,1, α are the roots of $x^3 -6x^2 +9x-4=0$, then find α

41. ***If $-1,2, \alpha$ are the roots of $2x^3 +x^2 -7x-6=0$, then find α

42. ** If 1, -2, 3 are the roots of $x^3-2x^2 + ax+6 = 0$ then find 'a'.

43. ** If $\alpha, \beta, 1$ are the roots of $x^3 -2x^2 -5x+6=0$, then find α and β

44. If the product of the roots of $4x^3 + 16x^2-9x -a = 0$ is 9, then find 'a'

45. If α, β and γ are the roots of $x^3-2x^2+3x - 4 = 0$ then find

   i) $\sum \alpha^2\beta^2$ *** ii) $\sum \alpha^2\beta+\sum \alpha\beta^2$

46. Form the equation whose roots are i) $2\pm\sqrt{3}, 1\pm 2i$ ii) $0, 1, \dfrac{-3}{2}, \dfrac{-5}{2}$ iii) $1\pm i, -1\pm i$

47. Find the Quotient and remainder when $x^4 -11x^3 + 44x^2 - 76x + 48$ is divided by $x^2-7x+12$

48. Find the equation whose roots are negatives of the roots of $x^4+5x^3 + 11x +3 = 0$

49. ***Find the polynomial equation whose roots are the squares of the roots of $x^3 + 3x^2 - 7x + 6 = 0$

50. Find the equation whose roots are cubes of the roots of $x^3+3x^2 +2 = 0$

51. **Find the equation whose roots are reciprocals of the roots of $x^4 + 3x^3 - 6x^2 + 2x - 4 = 0$

52. If α, β, γ are the roots of the equations $x^3 + 2x^2 - 4x - 3 = 0$ find the equation whose roots are 3 times the roots of given equation.

53. If α, β, γ are the roots of $x^3+2x^2-4x-3 = 0$ the find the equation whose roots are $\dfrac{\alpha}{3}, \dfrac{\beta}{3}, \dfrac{\gamma}{3}$

PERMUTATIONS & COMBINATIONS

54. If $^n P_r = 5040$ and $^n C_r = 2010$ find 'n' and 'r'.

55. ** If $^{12}P_5 + 5\,^{12}P_4 = ^{13}P_r$ find 'r'

56. a) If $^n P_4 = 1680$ then find 'n' b) $(n+1)p_5 : np_5 = 3 : 2$ find n ** c) If $^n P_7 = 42.\,^n P_5$ then find 'n'

57. a) If $^{(n+1)}P_5 : {}^nP_6 = 2 : 7$, find n   b) If $^{(n+1)}P_5 : {}^nP_5 = 3 : 2$, find n

58. Find the number of ways of arranging the letters of the word TRIANGLE so that the relative positions of the vowels and consonants are not disturbed

59. Find the number of different chains that can be prepared using 7 different coloured beads.

60. There are 5 copies each of 4 different books. Find the number of ways arranging these books in a shelf in a single row

61.** How many numbers can be formed using all the digits 1,2,3,4,3,2,1 such that even digits always occupy even places.

62. Find the number of 5 letter words that can be formed using the letters of the word NATURE, that begin with 'N' when repetition is allowed.

63. Find the number of 4 letter words that can be formed using the letters of the word PISTON in which at least one letter is repeated.

64. Find the number of ways of arranging the letters of the word   **i) PERMUTATION

ii) MATHEMATICS **iii) INDEPENDENCE   iv) CORRUPTION   v) INTERMEDIATE

vi) COMBINATION

65.** Find the number of injections from set A containing 4 elements in to a set B containing 6 elements

66.**Find the number of bijections from a set A containing 7 elements on to itself.

67. Find the number of 5–digit numbers that can be formed using all the digits 0, 1,1,2, 3

68. **a) If $^{12}C_{r+1} = {}^{12}C_{3r-5}$ find 'r'   b) If $^{15}C_{2r-1} = {}^{15}C_{2r+4}$ find 'r'

69. If $^nC_{21} = {}^nC_{27}$, then find $^{49}C_n$

70.*** Find the value of $^{10}C_5 + 2^{10}C_4 + {}^{10}C_3$

71. If a set A has twelve elements, then find the number of subsets of A having 4 elements.

72.***Find the number of ways of selecting 3 vowels and 2 consonants from the letters of the word

'EQUATION'

73. How many 5 letter words can be formed using 3 consonants and 2 vowels from the letters of the word   MIXTURE.

74.***Find the number of positive divisors of 1080.

75. Find the number of ways in which 4 letters can be put in 4 addressed envelopes so that no letter goes into the envelope meant for it.

76.***In how many ways 9 mathematics papers can be arranged so tha the best and the worst

i) may come together   ii) may not come together

77. Find the number of zeros in 100!

78. Find the number of palindromes with 6 digits that can be formed using the digits

i) 0, 2,4, 6, 8   ii) 1, 3, 5, 7, 9

BINOMIAL THEOREM

79. Find the number of terms in the expansion of ******* i) $(2a + 3b + c)^7$ ii) $\left[\dfrac{3a}{4} + \dfrac{b}{2}\right]^9$

80. Find the coefficient of x^{-7} in the expansion of $\left(\dfrac{2x^2}{3} - \dfrac{5}{4x^5}\right)^7$

81. Find the middle terms in the expansion of i) $\left(\dfrac{3x}{7} - 2y\right)^{10}$ ii) $\left(4a + \dfrac{3}{2}b\right)^{11}$

82. Find the term independent of 'x' in the expansion of ****** i) $\left(4x^3 + \dfrac{7}{x^2}\right)^{14}$ ii) $\left(\sqrt{\dfrac{x}{3}} + \dfrac{3}{2x^2}\right)^{10}$

83. ****** If $^{22}C_r$ is the largest binomial coefficient in the expansion of $(1+x)^{22}$ find the value of $^{13}C_r$

84 ******. Find the 3rd term from the end in the expansion of $\left(x^{\frac{-2}{3}} - \dfrac{3}{x^2}\right)^8$

85. Prove that $2.C_o + 5.C_1 + 8.C_2 + ... + (3n+2).C_n = (3n+4)2^{n-1}$

86. Find the set of values of 'x' for which the following expansions are valid

     *** i) $(2+3x)^{-2/3}$ ii) $(3-4x)^{3/4}$

87. Find the sum of last 20 coefficients in the expansion of $(1+x)^{39}$

88. ****** Find the number of terms with non – zero coefficients in $(4x - 7y)^{49} + (4x + 7y)^{49}$.

89. If A and B are coefficients of x^n in the expansion of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, then find the value of $\dfrac{A}{B}$.

MEASURES OF DISPERSION

90. ******* Find the mean deviation about the mean for the following data

     i) 38, 70, 48, 40, 42, 55, 63, 46, 54,44

91. ******* Find the mean deviation about the median for the following data.

     i) 13, 17, 16,11, 13, 10, 16, 11, 18, 12, 17

92. Find the mean deviation about the mean for the following distribution.

x_i	10	30	50	70	90
f_i	4	24	28	16	8

93. ******* Find the mean deviation about the median for the following frequency distribution

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

94.** Find the mean deviation from the mean of the following discrete data: 6, 7, 10, 12, 13, 4, 12, 16

95. Find the variance for the discreate data given below. 6, 7, 10, 12, 13, 4, 8, 12

96. Find the variance and standard deviation of the following data: 5, 12, 3, 18, 6, 8, 2, 10.

97.*** The variance of 20 observation is 5. If each of the observations is multiplied by 2, find the variance of the resulting observations.

98. If each of the observations x_1, x_2,......... x_n is increased by k, where k is a positive or negative number, then show that the variance remains unchanged.

RANDOM VARIABLES AND PROBABILITY DISTRBUTIONS

99. If X is poisson varitate such that $P(x=0)= P(X=1) = k$ then show that $k = \dfrac{1}{e}$

100. A poisson variable satisfies $P(X=1) = P(X=2)$ find $P(X=5)$

101. If x follows a poisson distribution and $P(x=1) = 3P(x=2)$, then find the variance of x.

102. The mean and variance of a binomial distribution are 4 and 3 respectively. Find $P(x \geq 1)$ and n, p

103. In a city 10 accidnets takes place in a span of 50 days, assuming that the number of accidents follows the poisson distribution, find the probability that there will be three or mor accidents in a day.

104. In a binomial distribution random variable X has mean $\dfrac{15}{2}$ and variance $\dfrac{15}{4}$. Find the distribution and parameters

105. If the mean variance of a binomial variable X are 2.4 and 1.44 respectively, find $P(1<X\leq4)$.

106. It is given that 10% of the electric bulbs manufactured by a company are defective. In a sample of 20 bulbs, find the probability that more than 2 are defective.

107. The probability that a person chosen at random is left handed (in hand writing) is 0.1. What is the probability that in a group of 10 people, there is one who is left handed.

108. If the difference between the mean and the variance of a binomial variate is 5/9 then find the probability for the event of 2 successes when the experiment is conducted 5 times.

109. On an average, rain falls on 12 days in every 30 days, find the probability that, rain will fall on just 3 days of a given week.

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MATHS - 2B TOPIC WISE WEIGHTAGE

How to Score Minimum 45-65 Marks For Slow Learners

S.NO	CHAPTER NAME	NO OF QUESTIONS			WEIGHTAGE
		LAQ's	SAQ's	VSAQ's	
1	Circles	16	17	33	22
2	System of Circles	-	17	10	6
3	Parabola	9	-	13	9
4	Ellipse	-	14	-	8
5	Hyperbola	-	3	10	6
6	Indefinite Integration	13	-	35	18
7	Definite Integration	7	6	8	15
8	Differential Equations	-	-	13	2
	TOTAL	45	57	122	86

- Circles
- System of Circles
- Parabola
- Ellipse
- Hyperbola
- Indefinite Integration
- Definite Integration
- Differential Equations
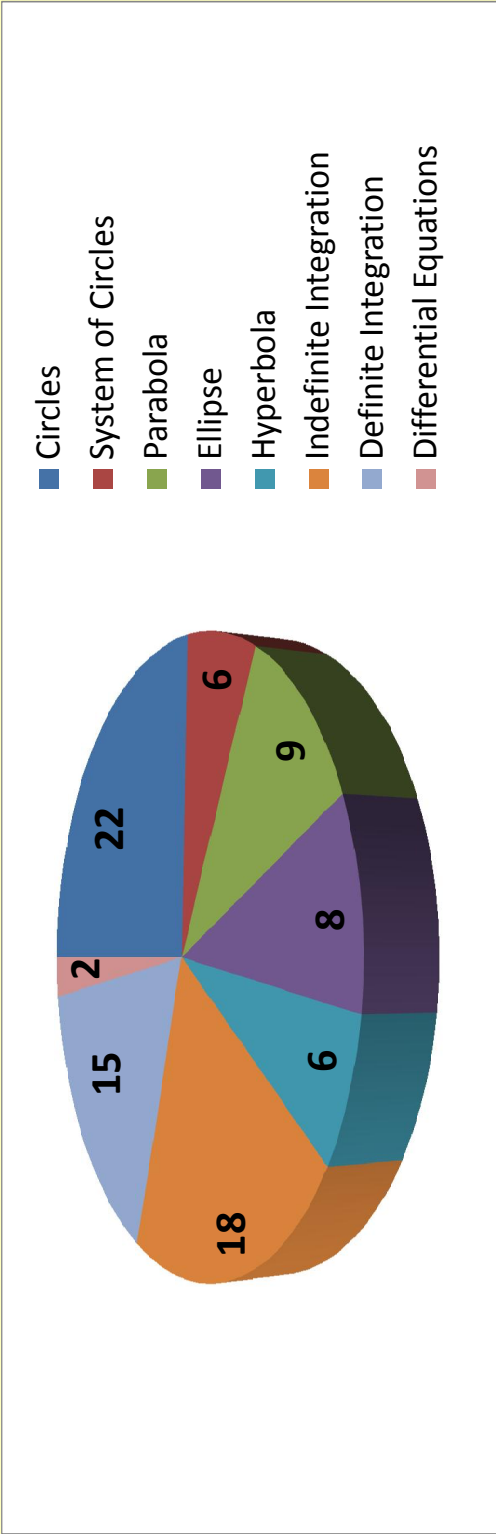
MATHS-2B

LAQ's (7 Marks Questions)

CIRCLES

1. ***Find the equation of the circle passing through the point

   i) $P(1,1)$ $Q(2,-1)$ and $R(3,2)$ ii) $(5,7)$, $(8,1)$ $(1,3)$

2. Find the equation of the circle passing through the points $(2,-3)$, $(-4,5)$ and having the centre on the line $4x+3y+1=0$

3. ***Find the equation of the circle which passes through the points $(4,1)$,$(6,5)$ and whose centre lies on $4x+3y-24=0$.

4. ***Find the equation of the circle whose centre lies on X-axis and passing through the points $(-2,3)$,$(4,5)$.

5. Show that the circles $x^2+y^2-6x-2y+1=0$;$x^2+y^2+2x-8y+13=0$ touch each other. Find the point of contact and the equation of common tangent at the point of contact.

6. ***Show that the circles $x^2+y^2-4x-6y-12=0$ and $x^2+y^2+6x+18y+26=0$ touch each other. Find the point of contact and the equation of common tangent at the point of contact.

7. ***Show that the circles $x^2 + y^2 - 6x - 9y + 13 = 0$, $x^2 + y^2 - 2x - 16y = 0$ touch each other, Also find the point of contact and common tangent at this point of contact

8. Show that the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ touch each other .Also find the point of contact and common tangnet at this point

9. ***Find the equations of the direct common tangents to the circles

   $x^2 + y^2 + 22x - 4y - 100 = 0$ and $x^2 + y^2 - 22x + 4y + 100 = 0$

10. ***Find the equations of transverse common tangents of $x^2 + y^2 - 4x - 10y + 28 = 0$;

    $x^2 + y^2 + 4x - 6y + 4 = 0$.

11. ***Find the equations of the circles which touch $2x-3y+1=0$ at $(1,1)$ and having radius $\sqrt{13}$

12. ***Find the value of 'c' if the points $(2,0)$,$(0,1)$,$(4,5)$ and $(0,c)$ are concyclic.

13. ***i) Show that the four points $(-6,0)$,$(-2,2)$,$(-2,-8)$ and $(1,1)$ are concyclic

    ii) Show that the four points $(9,1)$,$(7,9)$,$(-2,12)$ and $(6,10)$ are concyclic

14. ***Find an equation to the pair of tangents drawn from the point (x_1,y_1) to the circle

    $x^2 + y^2 + 2gx + 2fy + c = 0 \left(S_1^2 = S.S_{11}\right)$.

15. ***If the polar of points on the circle $x^2+y^2=a^2$ with respect to $x^2+y^2=b^2$ touches the circle $x^2+y^2=c^2$ then show that a,b,c are in G.P.

16. If $y = mx + c$ and $x^2 + y^2 = a^2$ intersect at A and B if AB= 2λ then show that $c^2 = \left(1+m^2\right)\left(a^2 - \lambda^2\right)$

PARABOLA

17. ***Derive the equation of parabola $y^2=4ax$ in standard form.

18. ***Find the focus, vertex,equation of the directrix, axes and the length of the latusretum to the parabola
    i) $y^2-x+4y+5 = 0$ ii) $3x^2-9x+5y-2 = 0$ iii) $x^2+8x+12y+4 = 0$

19. **Show that the equations of the common tangents to the circle $x^2 + y^2 = 2a^2$ and the parabola $y^2 = 8ax$ are $y = \pm(x + 2a)$

20. ** The normal at a point 't_1' on $y^2=4ax$ meets the parabola again at the point 't_2'. Then prove that

$$t_2 = -\left(t_1 + \frac{2}{t_1}\right) (or)\, t_1 t_2 + t_1^2 + 2 = 0$$

21. ***Prove that the area of the triangle formed by the tangents at (x_1, y_1), (x_2, y_2) and (x_3, y_3) to the

parabola $y^2 = 4ax$ $(a > 0)$ is $\dfrac{1}{16a}\left|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)\right|$ square units

22. ***Prove that the area of the triangle Inscribed in the parabola $y^2 = 4ax$ is

$\dfrac{1}{8a}\left|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)\right|$ square units where y_1, y_2, y_3 are the ordinates of its vertices.

23. ***Find the equation of the parabola whose axis is parallel to y-axis and which passes through the points (4,5),(-2,11) and (-4,21).

24. ***Find the equation of the parabola whose axis is parallel to 'x' – axis and which passes through the points $(-1, 2)$, $(1, -1)$ $(2, 1)$

25. Find the equation of the parabola whose focus is (-2,3) and directrix is the line 2x+3y-4=0.Also find the length of the latusrectum and the equation of axis of the parabola.

INDEFINITE INTEGRATION

26. ***i) Evaluate $\displaystyle\int \frac{2\cos x + 3\sin x}{4\cos x + 5\sin x}\, dx$ ii) Evaluate $\displaystyle\int \frac{9\cos x - \sin x}{4\sin x + 5\cos x}\, dx$

27. ***i) Evaluate $\displaystyle\int \frac{\cos x + 3\sin x + 7}{\cos x + \sin x + 1}\, dx$ ii) Evaluate $\displaystyle\int \frac{2\sin x + 3\cos x + 4}{3\sin x + 4\cos x + 5}\, dx$

28. ***i) Evaluate $\displaystyle\int (6x + 5)\sqrt{6 - 2x^2 + x}\, dx$ ii) Evaluate $\displaystyle\int (3x - 2)\sqrt{2x^2 - x + 1}\, dx$

29. ***i) Evaluate $\displaystyle\int \frac{dx}{3\cos x + 4\sin x + 6}$ ii) Evaluate $\displaystyle\int \frac{1}{4\cos x + 3\sin x}\, dx$

30. i) Evaluate $\displaystyle\int \frac{dx}{5 + 4\cos x}$ ii) Evaluate $\displaystyle\int \frac{1}{4 + 5\sin x}$

31. ***i) Evaluate $\displaystyle\int \frac{2x + 5}{\sqrt{x^2 - 2x + 10}}\, dx$ ii) Evaluate $\displaystyle\int \frac{x + 1}{x^2 + 3x + 12}\, dx$ iii) Evaluate $\displaystyle\int \sqrt{\frac{5 - x}{x - 2}}\, dx$

32. ***Evaluate i) $\displaystyle\int \frac{1}{(1 + x)\sqrt{3 + 2x - x^2}}\, dx$

33. ***If $I_n = \displaystyle\int \sin^n x\, dx$ then $I_n = \dfrac{-\sin^{n-1} x \cdot \cos x}{n} + \dfrac{n-1}{n} I_{n-2}$; where n is a +ve integer, Find $\displaystyle\int \sin^4 x\, dx$

34. ***If $I_n = \displaystyle\int \cos^n x\, dx$ then $I_n = \dfrac{\cos^{n-1} x \cdot \sin x}{n} + \dfrac{n-1}{n} I_{n-2}$; where n is a positive integer.

35. ***Find the reduction formula for $\int \tan^n x\,dx$ and hence find $\int \tan^6 x\,dx$

36. If $I_n = \int \sec^n x\,dx$ then $I_n = \dfrac{\sec^{n-2} x \cdot \tan x}{n-1} + \dfrac{n-2}{n-1} I_{n-2}$, Find $\int \sec^5 x\,dx$

37. Find the reaction formula for $I_n \int \cot^n x\,dx$, n being pasitive integer $n \geq 2$ and hence reduce the value of $\int \cot^4 x\,dx$

38. If $I_n = \int \cos ec^n x.dx$ then $I_n = -\dfrac{\cos ec^{n-2} x.\cot x}{n-1} + \dfrac{n-2}{n-1} I_{n-2}$

DEFINITE INTEGRATION

39. ***i) Evaluate $\displaystyle\int_0^1 \dfrac{\log(1+x)}{1+x^2}\,dx$ ii) Show that $\displaystyle\int_0^{\pi/4} \dfrac{\sin x + \cos x}{9 + 16\sin 2x}\,dx = \dfrac{1}{20}\log 3$

40. **i) Show that $\displaystyle\int_0^{\pi/2} \dfrac{x}{\sin x + \cos x}\,dx = \dfrac{\pi}{2\sqrt{2}}\log\left(\sqrt{2}+1\right)$

   ii) Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{\sin^2 x}{\cos x + \sin x}\,dx$ iii) $\displaystyle\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \dfrac{\cos x}{1+e^x}\,dx$

41. ***i) Evaluate $\displaystyle\int_0^{\pi} \dfrac{x\sin x}{1+\cos^2 x}\,dx$

   ***ii) Evaluate $\displaystyle\int_0^{\pi} \dfrac{x\sin^3 x}{1+\cos^2 x}\,dx$

42. ***Find the area bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4by$

43. ***Find the area of the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$. Also deduce the area of the circle $x^2 + y^2 = a^2$.

44. **Find the area enclosed between the curves $y^2 = 4x$, $y^2 = 4(4-x)$

45. ***Show that the area enclosed between curves $y^2 = 12(x+3), y^2 = 20(5-x)$ is $64\sqrt{\dfrac{5}{3}}$

SAQ's (4 Marks Questions)
CIRCLES

1. **If a point P is moving such that the lengths of the tangents drawn from P to $x^2+y^2-4x-6y-12=0$ and $x^2+y^2+6x+18y+26=0$ are in the ratio 2:3 then find the equation of locus of P.

2. Find the equation of the circle with centre (-2, 3) cutting a chord length '2' units on $3x+4y+4=0$.

3. i) Find the length of the chord intercepted by the circle $x^2 + y^2 - x + 3y - 22 = 0$ on the line $y = x - 3$
   ii) Find the mid point of the chord intercepted by the circle $x^2 + y^2 - 2x - 10y + 1 = 0$ on the line $x - 2y + 7 = 0$

iii) Find the length of the chord intercepted by the circle $x^2 + y^2 - 8x - 2y - 8 = 0$ on the line x+y+1=0

4.** Show that the tangent at (-1,2) of the circle $x^2 + y^2 - 4x - 8y + 7 = 0$ touches the circle
$x^2 + y^2 + 4x + 6y = 0$ and find its point of contact.

5. Find the equations of the tangents to the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ which are parallel to
x + y - 8 = 0.

6. Find the equations of the tangents to the circle $x^2 + y^2 + 2x - 2y - 3 = 0$ which are perpendicular to
3x - y + 4 = 0

7.** Show that x + y +1=0 touches the circle $x^2 + y^2 - 3x + 7y + 14 = 0$ and find the point of contact.

8. Find the pole of the line 3x + 4y - 45 = 0 w.r. to circle $x^2 + y^2 - 6x - 8y + 5 = 0$

9.*** Find the value of k if kx + 3y - 1 = 0, 2x + y + 5 = 0 are conjugate lines with respect to the circle
$x^2 + y^2 - 2x - 4y - 4 = 0$.

10.** Find the pair of tangents drawn form P(3,2) to the circle $x^2 + y^2 - 6x + 4y - 2 = 0$

11. Find the pair of tangents from (4, 10) to the circle $x^2 + y^2 = 25$

12. Find the angle between tangents drawn from (3,2) to the circle $x^2+y^2-6x + 4y - 2 = 0$

13.*** Find the inverse point of (-2,3) with respect to the circle $x^2 + y^2 - 4x - 6y + 9 = 0$.

14.*** Find the equation of the circle which touches the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ externally at (5,5) with
radius 5 units.

15***. Find the equation of the circle which touches $x^2 + y^2 - 4x + 6y - 12 = 0$ at (-1,1) internally with a
radius of 2.

16. If the abscissae of points A,B are the roots of the equation $x^2 + y^2 + 2ax - b^2 = 0$ and ordinates of A,B
are roots of $y^2 + 2py - q^2 = 0$ then find the equation of the circle for which $\overline{AB}$ is a diameter.

17. If a point p is moving such such that the lengths of tangents drawn from p to
$x^2 + y^2 - 2x + 4y - 20 = 0$ and $x^2 + y^2 - 2x - 8y + 1 = 0$ are in the ratio 2:1 then show that the equa-
tion of the locus of p is $x^2 + y^2 - 2x - 12y + 8 = 0$

SYSTEM OF CIRCLES

18. Find the equation of the circle which is orthogonal to each of the following circles
***i) $x^2 + y^2 + 2x + 4y + 1 = 0$, $x^2+y^2-2x + 6y - 3 = 0$, $2(x^2+y^2) + 6x + 8y - 3 = 0$.
ii) $x^2 + y^2 + 3x + 2y + 1 = 0$, $x^2+y^2-x + 6y+53 = 0$, $x^2+y^2+5x -8y+15 = 0$.

19.** Find the equation of the circle which passes through (1, 1) and cuts orthogonally each of the circles x^2
$+ y^2 - 8x - 2y + 16 = 0$, and $x^2 + y^2 - 4x - 4y - 1 = 0$

20. Find the equation of the circle which passes through the origin and intersects the circles
i) $x^2 + y^2 - 4x + 6y + 10 = 0$, $x^2 + y^2 + 12y + 6 = 0$ orthogonally.

21. Find the equation of the circle which passes through the points (2, 0), (0, 2) and orthogonal to the circle
$2x^2 + 2y^2 + 5x - 6y + 4 = 0$

22. Find the equation of the circle passing through the origin having its centre on the line x + y = 4 and
intersecting the circle $x^2 + y^2 - 4x + 2y + 4 = 0$ orthogonally.

23. Find the equation of the circle which intersects the circle $x^2 + y^2 - 6x + 4y - 3 = 0$ orthogonally and
passes through the point (3, 0) and touches Y – axis.

24. Find the equation of the circle cutting orthogonally to the circles $x^2+y^2-4x-6y+11=0$,
$x^2+y^2-10x-4y+21=0$ and has 2x+3y=7 as diameter.

25. Show that the circles $x^2 + y^2 - 2x = 0$ and $x^2 + y^2 + 6x - 6y + 2 = 0$ touch each other. Find the
coordinates of the point of contact. Is the point of contact external or internal?

26.*** Show that the circles
$S \equiv x^2 + y^2 - 2x - 4y - 20 = 0$
$S^1 \equiv x^2 + y^2 + 6x + 2y - 90 = 0$
touch each other internally. Find the point of contact and the equation of the common tangent

27.** If the two circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g^1x + 2f^1y = 0$ touch each other then show $f^1g = fg^1$

28.*** Show that the circles $x^2+y^2+2ax+c=0$ and $x^2+y^2+2by+c=0$ touch each other if $\dfrac{1}{a^2} + \dfrac{1}{b^2} = \dfrac{1}{c}$.

29.*** Show that the common chord of the circles $x^2 + y^2 - 6x - 4y + 9 = 0$ and $x^2 + y^2 - 8x - 6y + 23 = 0$ is the diameter of the second circle and also find its length.

30. Find the equation and length of the common chord of the two circles.

$S \equiv x^2 + y^2 + 3x + 5y + 4 = 0$

$S^1 \equiv x^2 + y^2 + 5x + 3y + 4 = 0$

31. Find the equation of the circle passing through the points of intersection of the circles $x^2 + y^2 - 8x - 6y + 21 = 0$, $x^2 + y^2 - 2x - 15 = 0$ and $(1, 2)$

32. If the straight line $2x + 3y = 1$ intersects the circle $x^2 + y^2 = 4$ at the points 'A' and 'B' the find the equation of the circle having AB as diameter.

33. If the straight line represented by $x \cos \alpha + y \sin \alpha = p$ intersects the circle $x^2 + y^2 = a^2$ at the points A and B, then show that the equation of the circle with $\overline{AB}$ as diameter is $\left(x^2 + y^2 - a^2\right) - 2p\left(x \cos \alpha + y \sin \alpha - p\right) = 0$

34.*** Find the equation of the circle whose diameter is the common chord of the circles $S = x^2 + y^2 + 2x + 3y + 1 = 0$, $S^1 = x^2 + y^2 + 4x + 3y + 2 = 0$

ELLIPSE

35.*** Find the centre, eccentricity, vertices, foci, length of major axis, minor axis, latusrectum and the equations of directrices, latusrectum and axes of the ellipse.

i) $4x^2 + y^2 - 8x + 2y + 1 = 0$ ii) $9x^2 + 16y^2 - 36x + 32y - 92 = 0$ iii) $9x^2 + 16y^2 = 144s$

36.*** Find the equation of the tangents to the ellipse $2x^2 + y^2 = 8$ which are

i) parallel to $x - 2y - 4 = 0$

ii) Perpendicular to $x + y + 2 = 0$

iii) which makes an angle $\dfrac{\pi}{4}$ with 'x'–axis

37.** Find the equation of the ellipse with focus at $(1, -1)$ $e = \dfrac{2}{3}$ and directrix is $x + y + 2 = 0$

38.** Prove that the condition for the straight line $y = mx + c$ to be a tangent to the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ ($a > b$) is $c^2 = a^2m^2 + b^2$

39*** The equation of the normal at $P(x_1, y_1)$ to the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ is $\dfrac{a^2x}{x_1} - \dfrac{b^2y}{y_1} = a^2 - b^2$ $\left(x_1 \neq 0, y_1 \neq 0\right)$

40.*** Find the equation of tangent and normal to the ellipse $9x^2 + 16y^2 = 144$ at the end of the latusrectum in the first quadrant

41.*** If the normal at one end of latusrecturn of the ellipse passes through one end of minor axis, then show that $e^4 + e^2 = 1$ [where e is the eccentricity of the ellipse]

42.** Show that the points of intersection of the perpendicular tangents to an ellipse lies on a circle. (Director Circle).

43.** If P(x, y) is any point on the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1 (a > b)$ whose foci are 'S' and 'S^1' then

$SP + S^1P$ is a constant

44. If a tangent to the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1 (a > b)$ meets its major axis and minor axis at M and N

respectively then prove that $\dfrac{a^2}{(CM)^2} + \dfrac{b^2}{(CN)^2} = 1$ where C is the centre of the ellipse

45.** If the length of the latus rectum is equal to half of its minor axis of an ellipse in the standard form. Then find the eccentricity of the ellipse.

46.*** Find the equation of the ellipse in the standard form such that distance between foci is '8' and distance between directrices is 32.

47. Find the equation of the ellipse in the standard form whose distance between foci is '2' and the length

of latusrectum is $\dfrac{15}{2}$.

48.*** Find the equation of tangent and normal to the ellipse $x^2 + 2y^2 - 4x + 12y + 14 = 0$ at $(2, -1)$

HYPERBOLA

49.*** Find the centre, eccentricity, vertices, foci, length of latusrectum and the equations of directrices of the hyperbola i) $5x^2 - 4y^2 + 20x + 8y = 4$ ii) $4x^2 - 9y^2 - 8x - 32 = 0$ iii) $14(y+3)^2 - 9(x-2)^2 = 1$

50.*** Find the equations of the tangents to the hyperbola $3x^2 - 4y^2 = 12$ which are i) parallel and
ii) perpendicular to the line $y = x - 7$.

51. Find the equations of the tangents to the hyperbola $x^2 - 4y^2 = 4$ which are
i) parallel and ii) perpendicular to the line $x + 2y = 0$

DEFINITE INTEGRATION

52. **i) Evlauate $\displaystyle\int_0^\pi \dfrac{x \sin x}{1 + \sin x}\,dx$ ii) $\displaystyle\int_0^\pi \dfrac{x}{1 + \sin x}\,dx$

53.** Evlauate $\displaystyle\int_0^{\pi/2} \dfrac{1}{4 + 5\cos x}\,dx$ ii) Evaluate $\displaystyle\int_0^1 x \tan^{-1} x\,dx$ iii) Evaluate $\displaystyle\int_0^2 \dfrac{a\sin x + b\cos x}{\sin x + \cos x}\,dx$

54**. Evaluate $\displaystyle\int_0^\pi x \sin^7 x.\cos^6 x\,dx$ 55.** Evaluate i) $\displaystyle\int_0^{\pi/2} \dfrac{\cos^{\frac{5}{2}} x}{\sin^{\frac{5}{2}} x + \cos^{\frac{5}{2}} x}\,dx$ ii) $\displaystyle\int_{\frac{\pi}{6}}^{\pi/3} \dfrac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\,dx$

56.** Evaluate $\displaystyle\lim_{n\to\infty} \dfrac{2^k + 4^k + 6^k + \cdots\cdots - (2n)^k}{n^{k+1}}$ by using limit as sum.

57. Evaluate $\displaystyle\lim_{n\to\infty} \left[\left(1 + \dfrac{1}{n}\right)\left(1 + \dfrac{2}{n}\right) - - - - - \left(1 + \dfrac{n}{n}\right)\right]^{\frac{1}{n}}$

58.** i) Evaluate $\displaystyle\lim_{n\to\infty} \dfrac{1}{n}\left[\tan\dfrac{\pi}{4^n} + \tan\dfrac{2\pi}{4n} + - - - - - - + \tan\dfrac{n\pi}{4n}\right]$

VSAQ's (2 Marks Questions)

CIRCLES

2 Marks

1. If $x^2 + y^2 - 4x + 6y + c = 0$ represents a circle with radius '6' then find the value of 'c'.

2. If the length of the tangent from (2, 5) to the circle $x^2 + y^2 - 5x + 4y + k = 0$ is $\sqrt{37}$, then find K.

3. If the center of the circle $x^2 + y^2 + ax + by - 12 = 0$ is (2,3) find the values of a, b and the radius of the circle.

4. ****** Find the length of the tangent from (1, 3) to the circle $x^2 + y^2 - 2x + 4y - 11 = 0$

5. Find the length of the chord intercepted by the circle $x^2 + y^2 - 8x - 2y - 8 = 0$ on the line
   $x + y + 1 = 0$

6. Find the equation of the circle which is concentric with $x^2 + y^2 - 6x - 4y - 12 = 0$ and passing through
   (–2, 14)

7. ****** Find the values of a, b if $ax^2 + bxy + 3y^2 - 5x + 2y - 3 = 0$ represents a circle. Also find radius and centre
   of the circle.

8. Find the equation of the circle passing through (2, -1) and having the centre at (2,3).

9. ****** Show that the points (4, –2), (3, –6) are conjugate w.r to the circle $x^2 + y^2 - 24$.

10. Find the other end of the diameter of the circle $x^2 + y^2 - 8x - 8y + 27 = 0$ if one end of it is (2,3).

11. ****** Find the value of K if the points (4, k), (2,3) are conjugate with respect $x^2 + y^2 = 17$.

12. Obtain the parametric equation of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.

13. Find the power of the point P with respect to the circle $S = 0$ when
    $P = (2, 3)$ and $S = x^2 + y^2 - 2x + 8y - 23$

14. ****** Find the number of common tangents that can be drawn to the circles $x^2 + y^2 = 4$,
    $x^2 + y^2 - 6x - 8y + 16 = 0$.

15. If $x^2 + y^2 + 2gx + 2fy - 12 = 0$ represents a circle with centre (2, 3) find g, f and radius

16. Obtain parametric form of circle $(x - 3)^2 + (y - 4)^2 = 8^2$

17. Find the centre and radius of the circle $\sqrt{1 + m^2} \left(x^2 + y^2 \right) - 2cx - 2mcy = 0$

18. ****** Find the area of the triangle formed with the coordinate axes and the tangent drawn at the
    point (x_1, y_1) on the circle $x^2 + y^2 = a^2$.

19. ****** Find the pole of $ax + by + c = 0$ w.r.to $x^2 + y^2 = r^2$

20. Show that the line $lx + my + n = 0$ is a normal to the circle $S = 0$ if and only if $gl + my = n$.

21. Find the equation of the tangent at the point 30^0 (parmetric value of θ) of the circle
    $x^2 + y^2 + 4x + 6y - 39 = 0$

22. If the parametric values of two points 'A' and 'B' lying on the circle $x^2 + y^2 - 6x + 4y - 12 = 0$
    are 30^0 and 60^0 respectively then find the equation of the chord joining 'A' and 'B'

23. Find the equation of the circle with centre $C = \left(-\frac{1}{2}, -9 \right)$ and radius 5

24. Find the centre and radius of the circle $x^2 + y^2 + 6x + 8y - 96 = 0$

25. Find the value of a if $2x^2 + ay^2 - 3x + 2y - 1 = 0$ represents a circle and also find its radius

26. Locate the position of the point P(1,2) and $S = x^2 + y^2 + 6x + 8y - 96$

27. Find the equation of tangent at p=(3,4) and $S = x^2 + y^2 - 4x - 6y + 11$

28. Find the equation of tangent at p=(3,-4) and $S = x^2 + y^2 + x + y - 24$

29. Find the length of tangent from p=(-2,5) and $S = x^2 + y^2 - 25$

30. Define conjugate points

31. Define inverse points

32. Find the equaiton fo polar of (1,2) with respect to the circle $x^2+y^2=7$

33. Find the pole of the straight line $3x+4y-45=0$ w.r.t to the circle $x^2+y^2-6x-8y+5=0$

SYSTEM OF CIRCLES

34. **Find the angle between the circles
$x^2 + y^2 + 4x - 14y + 28 = 0$, $x^2 + y^2 + 4x - 5 = 0$

35. Find the angle between the circles given by the equations
$x^2 + y^2 - 12x - 6y + 41 = 0$, $x^2 + y^2 + 4x + 6y - 59 = 0$

36. ***If the angle between the circle $x^2 + y^2 - 12x - 6y + 41 = 0$, $x^2 + y^2 + kx + 6y - 59 = 0$ and is 45^0 find k.

37. ** Show that the angle between the circles $x^2 + y^2 = a^2$, $x^2 + y^2 = ax + ay$ is $\dfrac{3\pi}{4}$

38. Find k if the following pairs of circles are orthogonal
***i) $x^2 + y^2 + 2by - k = 0$, $x^2 + y^2 + 2ax + 8 = 0$
ii) $x^2 + y^2 - 5x - 14y - 34 = 0$, $x^2 + y^2 + 2x + 4y + k = 0$

39. Show that the circles given by the following equations intersect each other orthogonally
**i) $x^2 + y^2 - 2x - 2y - 7 = 0$, $3x^2 + 3y^2 - 8x + 29y = 0$
ii) $x^2 + y^2 - 2x + 4y + 4 = 0$, $x^2 + y^2 + 3x + 4y + 1 = 0$

40. Find the equation of the radical axis of the following circles.
i) $x^2 + y^2 - 3x - 4y + 5 = 0$, $3(x^2 + y^2) - 7x + 8y - 11 = 0$
**ii) $x^2 + y^2 - 2x - 4y - 1 = 0$, $x^2 + y^2 - 4x - 6y + 5 = 0$

41. Find the equation of the common chord of the following pair of circles.
i) $x^2 + y^2 - 4x - 4y + 3 = 0$, $x^2 + y^2 - 5x - 6y + 4 = 0$
**ii) $(x - a)^2 + (y - b)^2 = c^2$, $(x - b)^2 + (y - a)^2 = c^2$ $(a \neq b)$

42. Find the equation of the common tangent of the circles $x^2 + y^2 - 8y - 4 = 0$, $x^2 + y^2 - 2x - 4y = 0$ at their point of contact.

43. Find the radical centre of the circles $x^2 + y^2 + 4x - 7 = 0$, $2x^2 + 2y^2 + 3x + 5y - 9 = 0$, $x^2 + y^2 + y = 0$

PARABOLA

44. **If the coordinates of ends of a focal chord of the parabola $y^2 = 4ax$ are (x_1, y_1) & (x_2, y_2) then prove that $x_1 x_2 = a^2$, $y_1 y_2 = -4a^2$

45. ***A double ordinate of the curve $y^2 = 4ax$ is of length '8a' prove that the lines from the vertex to its ends are at right angles.

46. **Find the equation of the parabola whose latus rectum is the line segment joining the points (−3, 2) and (−3, 1)

47. Find the equation of the tangent to the parabola $y^2 = 16x$ inclined at an angle 60^0 with its axis. Find the point of contact.

48. ***Find the equations of the tangent and normal to the parabola $y^2 = 6x$ at the positive end of the

latusrectum

49. Find the equation of the parabola whose vertex is $(3, 2)$ and the focus is $(5, 2)$
50. Find the equation of the parabola whose focus is $S(1, -7)$ and vertex is $A(1, -2)$
51. Find the co – ordinates of the points on the parabola $y^2 = 8x$ whose focal distance is 10 units.

52. Find the coordinates of the points on the parabola $y^2 = 2x$ whose focal distance is $\dfrac{5}{2}$.

53. ***If $\left(\dfrac{1}{2}, 2\right)$ is one extremity of a focal chord of the parabola $y^2 = 8x$ find the coordinates of the otherextremity.

54. ***Find the value of 'K' if the line $2y = 5x + k$ touches the parabola $y^2 = 6x$.

55. Find the condition for the line $y = mx + c$ to touch the parabola $y^2 = 4ax$

56. Find the equation of the parabola whose focus $B(4, 5)$ and vertex is $(3, 6)$. Also find the length of locus rectum

HYPERBOLA

57. Find the eccentricity and length of latusrectum of the hyperbola $x^2 - 4y^2 = 4$.

58. ***If e, e_1 are eccentricities of a hyperbola and its conjugate hyperbola prove that $\dfrac{1}{e^2} + \dfrac{1}{e_1^2} = 1$

59. ** If the eccentrcity of a hyperbola is 5/4. Then find the eccentricity of its conjugate hyperbola.

60. ** If $3x - 4y + k = 0$ is a tangent to $x^2 - 4y^2 = 5$ find the value of k.

61. ** Find the equation of the normal at $\theta = \dfrac{\pi}{3}$ to the hyperbola $3x^2 - 4y^2 = 12$.

62. ***If the angle between the asymptotes of a hyperbola is 30^0 then find its eccentricity.

63. ***Find the equation of the hyperbola whose foci are $(\pm 5, 0)$ the transverse axis is of length 8.

64. ** Find the product of lengths of the perpendiculars from any point on the hyperbola $\dfrac{x^2}{16} - \dfrac{y^2}{9} = 1$ to its asymptotes.

65. Find the equation of the tangne tto the hyperbola $4x^2 - 9y^2 = 36$ at $\theta = \dfrac{\pi}{4}$

66. Obtain the equaiton to the hyperbola in standered form whose distance between foci 16 and $e = \sqrt{2}$

INDEFINITE INTEGRATION

67. Evaluate $\displaystyle\int \dfrac{x^2 dx}{\sqrt{1 - x^6}}$

68. Evaluate $\displaystyle\int \sqrt{1 - \cos 2x}\, dx$.

69. Evaluate i) $\displaystyle\int \sin^{-1} x\, dx$ ii) Evaluate $\displaystyle\int x Tan^{-1} x\, dx$

70. Evaluate i) $\displaystyle\int e^x [\tan x + \log(\sec x)]dx$.   ii) Evaluate $\displaystyle\int e^x \left(1 + \tan^2 x + \tan x\right) dx$.

iii) Evaluate $\int e^x \dfrac{(1+x\log x)}{x} dx$ iv) Evaluate $\int \dfrac{e^x(1+x)}{(2+x)^2} dx$

71.   Evaluate $\int \sec^2 x \cos ec^2 x dx$ on R.

72.   Evaluate $\int \dfrac{x^8}{1+x^{18}} dx$ on R.

73.   Find $\int \dfrac{\cot(\log x)}{x} dx$

74. $\int \dfrac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx$.

75.   Evaluate $\int \dfrac{(a^x - b^x)^2}{a^x b^x} dx$.

76.   Evaluate $\int \dfrac{\sec^2 x}{\sqrt{16+Tan^2 x}} dx$.

77.   Evaluate $\int \dfrac{dx}{\sqrt{x^2+2x+10}} dx$

78.   Evaluate $\int e^{2\log x} dx$

79.   Evaluate $\int \dfrac{1+\sin^2 x}{1+\cos 2x} dx$

80.   Evaluate $\int \sec x \log(\sec x + \tan x).dx$

81.   Evaluate $\int \dfrac{2x^3}{1+x^8} dx$

82.   Evaluate $\int \left(1 - \dfrac{1}{x^2}\right) e^{\left(x+\frac{1}{x}\right)}.dx$

83. $\int \dfrac{(1+x)e^x}{\cos^2(xe^x)}$

84. $\int \dfrac{1}{a\sin x + b\cos x} dx$

85. $\int \dfrac{1+\sin^2 x}{1+\cos 2x} dx$

86. $\int \sqrt{1+\sin 2x}\, dx$

87. $\int \dfrac{\sin^4 x}{\cos^6 x} dx$

88. $\int \sqrt{9x^2 - 25}\, dx$

89. $\int \dfrac{1}{x \log x}\, dx$

90. $\int \dfrac{1}{x \log x \left[\log(\log x) \right]}\, dx$

91. $\int \cos x \cos 3x\, dx$

92. $\int \dfrac{dx}{2\sin^2 x + 3\cos^2 x}\, dx$

93. $\int \dfrac{\cos x}{\sin^2 x + 4\sin x + 5}\, dx$

94. $\int \dfrac{1}{e^x + e^{-x}}\, dx$, $\int \left(x - \dfrac{1}{x} \right)^3 dx$

95. Evaluate $\int \dfrac{1}{\sqrt{1 - x^2}} + \dfrac{2}{\sqrt{1 + x^2}}\, dx$ on $(-1, 1)$

96. Evaluate $\int \dfrac{xe^x}{(x+1)^2}\, dx$

97. Evaluate $\int \dfrac{1}{(x+1)(x+2)}\, dx$

98. Evaluate $\int \dfrac{e^{\tan^{-1} x}}{x^2 + 1}\, dx$

99. Evaluate $\int \dfrac{1}{e^x + e^{-x}}\, dx$

100. Evaluate $\int \dfrac{1 + \cos^2 x}{1 - \cos 2x}\, dx$

101. Evaluate $\int \log x\, dx$

DEFINITE INTEGRATION

102. i) Find the value of $\displaystyle\int_0^{\pi/2} \dfrac{\cos^5 x}{\sin^5 x + \cos^5 x}\, dx$ ii) Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \dfrac{\cos x^{3/2}}{\sin^{3/2} x + \cos^{3/2} x}\, dx$

103. Evaluate $\displaystyle\int_2^3 \dfrac{2x}{1 + x^2}\, dx$ 104. Evaluate $\displaystyle\int_0^1 \left(\dfrac{x^2}{1 + x^2} \right) dx$ 105. Evaluate $\displaystyle\int_0^\pi \sqrt{2 + 2\cos\theta}\, d\theta$

106. Find $\displaystyle\int_0^2 \sqrt{4 - x^2}\, dx$ 107.i) Find $\displaystyle\int_2^4 |2 - x|\, dx$ ii) sFind $\displaystyle\int_0^2 |1 - x|\, dx, x > 1$ iii) $\displaystyle\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin|x|\, dx$

108. Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{1}{1 + \cot x}\, dx$

ii) Evalute $\displaystyle\int_0^{\frac{\pi}{2}} \dfrac{1}{1 + \tan x}\, dx$

109. Evaluate $\displaystyle\int_{-1}^1 \log\left(\dfrac{2 - x}{2 + x} \right) dx$ 110. $\displaystyle\int_0^{\frac{\pi}{2}} \sin^7 x\, dx$, $\displaystyle\int_0^{\frac{\pi}{2}} \cos^8 x\, dx$

111. $\displaystyle\int_0^1 \dfrac{x^3}{x^2 + 1}\, dx$ ii) Evaluate $\displaystyle\int_0^1 \dfrac{1}{e^x + e^{-x}}\, dx$

112.. i) Evaluate $\displaystyle\int_{0}^{\pi/2} \sin^4 x \cos^5 x \, dx$ ii) Find $\displaystyle\int_{-\pi/2}^{\pi/2} \sin^2 x \cos^4 x \, dx$ iii) Evaluate $\displaystyle\int_{-\pi/2}^{\pi/2} \sin^3 x \cos^3 x \, dx$

113. Evaluate $\displaystyle\int_{0}^{\pi/2} \frac{\sin^2 x - \cos^2 x}{\sin^2 x + \cos^2 x} \, dx$

DIFFERENTIAL EQUATIONS

114. Find the order and degree of $\dfrac{d^2 y}{dx^2} + 2\dfrac{dy}{dx} + y = \log\left(\dfrac{dy}{dx}\right)$.

115. Find the order and degree of $\left[\left(\dfrac{dy}{dx}\right)^{1/2} + \left(\dfrac{d^2 y}{dx^2}\right)^{1/3}\right]^{1/4} = 0$

116. Find the order and degree of $\left[\dfrac{d^2 y}{dx^2} + \left(\dfrac{dy}{dx}\right)^3\right]^{\frac{6}{5}} = 6y$

117. Find the order and degree of $x^{1/2}\left(\dfrac{d^2 y}{dx^2}\right)^{1/3} + x\dfrac{dy}{dx} + y = 0$

118. Find order and degree of $1 + \left(\dfrac{d^2 y}{dx^2}\right)^2 = \left(2 + \left(\dfrac{dy}{dx}\right)^2\right)^{\frac{3}{2}}$

119. Form the differential equation corresponding to $y = cx - 2c^2$, where c is a parameter.
120. Form the differential equation corresponding to the family of circles passing through the origin and having centers of Y-axis.
121. Form the differential equation $y = A\cos 3x + B\sin 3x$ where A and B are parameters
122. Form the differential equation $y = c(x - c)^2$, c parameter
123. Form the differential equation $y = a \cos (nx + b)$; a, b parameter
124. Form the differential equation corresponding to the family of circles centre at origin, find order of it
125. Find the I.F of the differential equation
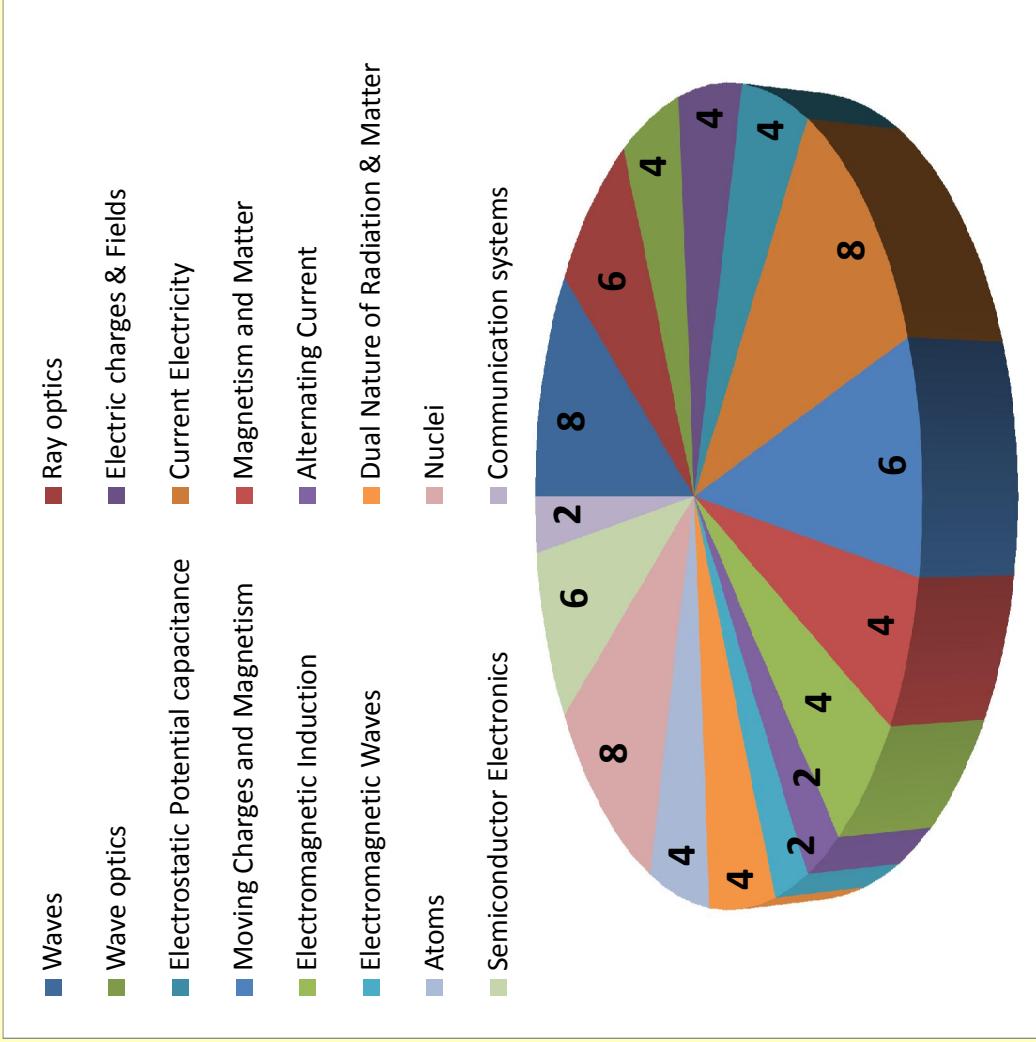
i) $(1 + y^2)dx = (Tan^{-1}y - x) \, dy$.

ii) $x\dfrac{dx}{dy} - y = 2x^2 \sec^2 2x$

iii) $\cos x \dfrac{dy}{dx} + y \sin x = \tan x$

iv) $\left(2x - 10y^3\right)\dfrac{dy}{dx} + y = 0$

PHYSICS TOPIC WISE WEIGHTAGE

How to Score Minimum 40-50 Marks For Slow Learners

S.NO	CHAPTER NAME	NO OF QUESTIONS			TOTAL
		LAQ's	SAQ's	VSAQ's	
1	Waves	1	-	-	8
2	Ray optics	-	1	1	6
3	Wave optics	-	1	-	4
4	Electric charges & Fields	-	1	-	4
5	Electrostatic Potential capacitance	-	1	-	4
6	Current Electricity	1	-	-	8
7	Moving Charges and Magnetism	-	1	1	6
8	Magnetism and Matter	-	-	2	4
9	Electromagnetic Induction	-	1	-	4
10	Alternating Current	-	-	1	2
11	Electromagnetic Waves	-	-	1	2
12	Dual Nature of Radiation & Matter	-	-	2	4
13	Atoms	-	1	-	4
14	Nuclei	1	-	-	8
15	Semiconductor Electronics	-	1	1	6
16	Communication systems	-	-	1	2
	TOTAL	3	8	10	76

Legend:
- Waves
- Wave optics
- Electrostatic Potential capacitance
- Moving Charges and Magnetism
- Electromagnetic Induction
- Electromagnetic Waves
- Atoms
- Semiconductor Electronics
- Ray optics
- Electric charges & Fields
- Current Electricity
- Magnetism and Matter
- Alternating Current
- Dual Nature of Radiation & Matter
- Nuclei
- Communication systems

SR.INTER PHYSICS IMP QUESTIONS

LAQ's (8 Marks Questions)

WAVES

1**. Explain the formation of stationary waves in stretched strings and hence deduce the laws of transverse waves in stretched strings.

2**. Explain the formation of stationary waves in an air column enclosed in open pipe. Derive the equations for the frequencies of the harmonics produced.

3**. How are stationary waves formed in closed pipe? Explain the various modes of vibrations and obtain relations for their frequencies.

4***. What is Doppler effect? Obtain an expression for the apparent frequency of sound heard when the source is in motion with respect to an observer at rest.

5***. What is Doppler shift? Obtain an expression for the apparent frequency of sound heard when the observer is motion with respect to a source at rest.

CURRENT ELECTRICITY

6***. State Kirchhoffs law for an electrical network. Using these laws deduce the condition for balance in a Wheatstone bridge.

7***. State the working principle of potentiometer explain with the help of circuit diagram how the emf of two primary cells are compared by using the potentiometer

8**. State the working principle of potentiometer explain with the help of circuit diagram how the potentiometer is used to determine the internal resistance of the given primary cell.

MOVING CHARGES AND MAGNETISM

9***. Obtain an expression for the torque on a current carrying loop placed in a uniform magnetic feild. Describe the construction and working of a moving coil galvanometer.

NUCLEI

10**. What is radioactivity? State the law of radioactive decay. Show that radioactive decay is exponential innature.

11***. Explain the principle and working of a nuclear reactor with the help of a labeled diagram.

SAQ's (4 Marks Questions)

RAY OPTICS AND OPTICAL INSTRUMENTS

1***. Define focal length of a concave mirror. Prove that the radius of curvature of a concave mirror is double its focal length.

2***. Define critical angle. Explain total internal reflection using a neat diagram.

3***. Explain the formation of a mirage.

4*. Explain the formation of a rainbow.

5. With a neat labelled diagram explain the formation of image in a simple microscope.

6***. What is the position of the object for a simple microscope? What is the maximum magnification of a simple microscope for a realistic focal length?

WAVE OPTICS

7***. Explain Doppler effect in light. Distinguish between red shift and blue shift.?

8**. Derive the expression for the intensity at a point where interference of light occurs. Arrive at the conditions for maximum and zero intensity.?

9**. How do you determine the resolving power of your eye?

10*. Discuss the intensity of transmitted light when a polaroid sheet is rotated between two crossed polaroids

11. Principal of sonservation of energy hold for interference and for difftration? Explain.

ELECTRIC CHARGES AND FIELDS

12**. State and explain Coulomb's inverse square law in electricity.?

13**. Define intensity of electric field at a point. Derive an expression for the intensity due to a point charge.?

14***.Derive the equation for the couple acting on a electric dipole in a uniform electric field.?

15**. Derive an expression for the intensity of the electric field at a point on the axial line of an electric dipole ?

16**. Derive an expression for the intensity of the electric field at a point on the equatorial plane of an electric dipole

17**. State Gauss's law in electrostatics and explain its importance.

ELECTROSTATIC POTENTIAL AND CAPACITANCE

18**. Derive an expression for the electric potential due to a point charge.

19**. Derive an expression for the potential energy of an electric dipole placed in a uniform electric field.

20***.Derive an expression for the capacitance of a parallel plate capacitor

21. Explain series combination of capacitors. Derive the formula for equivalent capacitance in each combination.

22. Explain parallel combination of capacitors. Derive the formula for equivalent capacitance in each combination.

23. Derive an expression for the energy stored in a capacitor.

MOVING CHARGES AND MAGNETISM

24***.State and explain Biot-Savart law.

25**. State and explain Ampere's law.

ELECTROMAGNETIC INDUCTION

26**. Describe the ways in which Eddy currents are used to advantage.

ATOMS

27***.What are the limitations of Bohr's theory of hydrogen atom?

28*. Describe Rutherford atom model. What are the draw backs of this model?

29*. Explain the different types of spectral series.

NUCLEI

30**. Write a short note on the discovery of neutron.

31***. Define half life period and decay constant for a radioactive substance. Deduce the relation between them.

32***. Distinguish between nuclear fission and nuclear fusion.

SEMICONDUCTOR ELECTRONICS MATERIALS, DEVICES AND SIMPLE CIRCUITS

33***. Describe how a semi conductor diode is used as a half wave rectifier.

34***. What is rectification? Explain the working of a full wave rectifier.

35***. Distinguish between half-wave and full-wave rectifiers.

36**. Distinguish between zener breakdown and avalanche breakdown.

37*. Explain the working of LED and what are its advantages over conventional incandescent low power lamps.

38***. Define NAND and NOR gates. Give their truth tables.

39. What is a Zener diode? Explain how it is used as a voltage regulator.

VSAQ's (2 Marks Questions)

RAY OPTICS AND OPTICAL INSTRUMENTS

1***. Define 'power' of a convex lens. What is its unit ?

2**. What is 'dispersion'? Which colour gets relatively more dispersed ?

3***. What is myopia ? How can it be corrected ?

4***. What is hypermetropia? How can it be corrected ?

ELECTRIC CHARGES AND FIELDS

5*. What is meant by the statement 'charge is quantized?

6**. Repulsion is the sure test of charging than attraction. Why?

7**. How many electrons constitute 1 C of charge

8**. What happens to the weight of a body when it is charged positively?

9**. What happens to the force between two charges if the distance between them is
a) halved   b) doubled?

10***. The electric lines of force do not intersect. why?

ELECTROSTATIC POTENTIAL AND CAPACITANCE

11**. What are meant by equipotential surfaces?

12**. Three capacitors of capacitances I μF , 2 μF , and 3 μF are connected in parallel.
a) What is the ratio of charge?
b) What is the ratio of potential differences?

13**. Three capacitors of capacitances 1 μF ,2 μF ,and 3 μF are connected in series

  a) What is the ratio of charge?

  b) What is the ratio of potential differences?

14**. What happens to the capacitance of a parallel plate capacitor if the area of its plates is doubled?

CURRENT ELECTRICITY

15***.State Ohm's law and write its mathematical form.

16**. Define resistivity or specific resistance

17***.Define temperature coefficient of resistance.

18***.Why is manganin used for making standard resistors?

19**. The sequence of bands marked on a carbon resistor are: Red, Red, Red, Silver. What is its resistance and tolerance?

20*. Write the color code of a carbon resistor of resistance 23 kilo ohms.

21*. If the voltage V applied across a conductor is increased to 2V, how will the drift velocity of the electrons change?

22**. Two wires of equal length, of copper and manganin, have the same resistance. Which wire is thicker?

23*. Why are household appliances connected in parallel?

MOVING CHARGES AND MAGNETISM

24*. What is the importance of Oersted's experiment?

25**. State Ampere's law and Biot -Savart law

26**. A circular coil of radius 'r' having N turns carries a current "i". What is its magnetic moment?

27*. What is the force on a conductor of length L carrying a current "i" placed in a magnetic field of in duction B? When does it becomes maximum?

28*. What is the force on a charged particle of charge "q" moving with a velocity "v" in a uniform magnetic field of induction B? When does it becomes maximum?

29**. Distinguish between ammeter and voltmeter.

30**. What is the principle of a moving coil galvanometer?

31*. What is the smallest value of current that can be measured with a moving coil galvanometer?

32**. How do you convert a moving coil galvanometer into an ammeter?

33**. How do you convert a moving coil galvanometer into a voltmeter?

MAGNETISM AND MATTER

34*. A magnetic dipole placed in a magnetic field experiences a ne t force.

35*. What can you say about the nature of the magnetic field?

36**. What happens to compass needles at the Earth's poles?

37**. What do you understand by the 'magnetization' of poles?

38*. What is the magnetic moment associated with a solenoid?

39**. What are the units of magnetic moment, magnetic induction and magnetic field?

40***. Magnetic lines form continuous closed loops. Why?

41**. Define magnetic declination.

42**. Define magnetic inclination or angle of dip.

43***.Classify the following materials with regard to magnetism. Manganese. Cobalt, Nickel. Bismuth. Oxygen.Copper

ELECTROMAGNETIC INDUCTION

44***.State Faraday's law of electromagnetic induction.

45***.State Lenz's Law

46*. What are Eddy currents?

47**. Define inductance

48***.What do you understand by 'self inductance'?

ALTERNATING   CURRENT

49***.A transformer converts 200 V ac into 2000 V ac. Calculate the number of turns in the secondary if the primary has 10 turns.

50***.What type of transformer is used in a 6V bed lamp?

51***.What is the phenomenon involved in the working of a transformer?

52***.What is transformer ratio?

53*. Write the expression for the reactance of i) an inductor and ii) a capacitor.

54*. What is the phase difference between AC emf and current in the following: Pure resistor, pure inductor and pure capacitor.

55**. Define power factor. On which factors does power factor depend?

56**. What is meant by wattless component of current?

57*. When does a LCR series circuit have minimum impedance?

58*. What is the phase difference between voltage and current when the power factor in LCR series circuit is unity?

ELECTROMAGNETIC   WAVES

59**. If the wavelength of electromagnetic radiation is doubled, what happens to the energy of photon?

60**. What is the principle of production of electromagnetic waves?

61*. What are the applications of microwaves?

62**. Microwaves are used in Radars, why?

63**. Give two uses of infrared rays.

DUAL NATURE OF RADIATION AND MATTER

64*. What are "cathode rays"?

65*. What important fact did Millikan's experiment establish?

66***.What is "work function" ?

67***.What is "photoelectric effect"?

68*.   Give examples of "photosensitive substances".Why are they called so?

69***.Write down Einstein's photoelectric equation.

70*.   Write down deBroglie's relation and explain the terms there in.

71**.   State Heisenberg's Uncertainty Principle.

ATOMS

72*.   What is the difference between α -particle and helium atom?

73*.   What do you understand by the phrase ground state atom ?

SEMICONDUCTOR ELECTRONICS MATERIALS, DEVICES AND SIMPLE CIRCUITS

74***.What is an n-type semiconductor?What are the majority and minority charge carriers in it?

75*.   What are intrinsic and extrinsic semiconductors?

76***.What is a p-type semiconductor? What are the majority and minority charge carriers in it?

77**.   How is a battery connected to a junction diode in i) forward and ii) reverse bias?

78*.   What is the maximum percentage of rectification in half wave and full wave rectifiers?

79*.   What happens to the width of the depletion layer in a p-n junction diode when it is i) forward-biased and ii) reverse biased?

80***.Draw the circuit symbols for p-n-p and n-p-n transistors.

81**.   Define amplifier and amplification factor.

82***.In which bias can a Zener diode be used as voltage regulator?

83***.Which gates are called universal gates?

84**.   Write the truth table of NAND gate. How does it differ from AND gate?

COMMUNICATION SYSTEM

85***.What are the basic blocks of a communication system?

86***.What is "World Wide Web" (WWW)?

87***.Mention the frequency range of speech signals.

88***.What is sky wave propogation?

89***.Mention the various parts of the ionosphere?

90***.Define modulation. Why is it necessary?

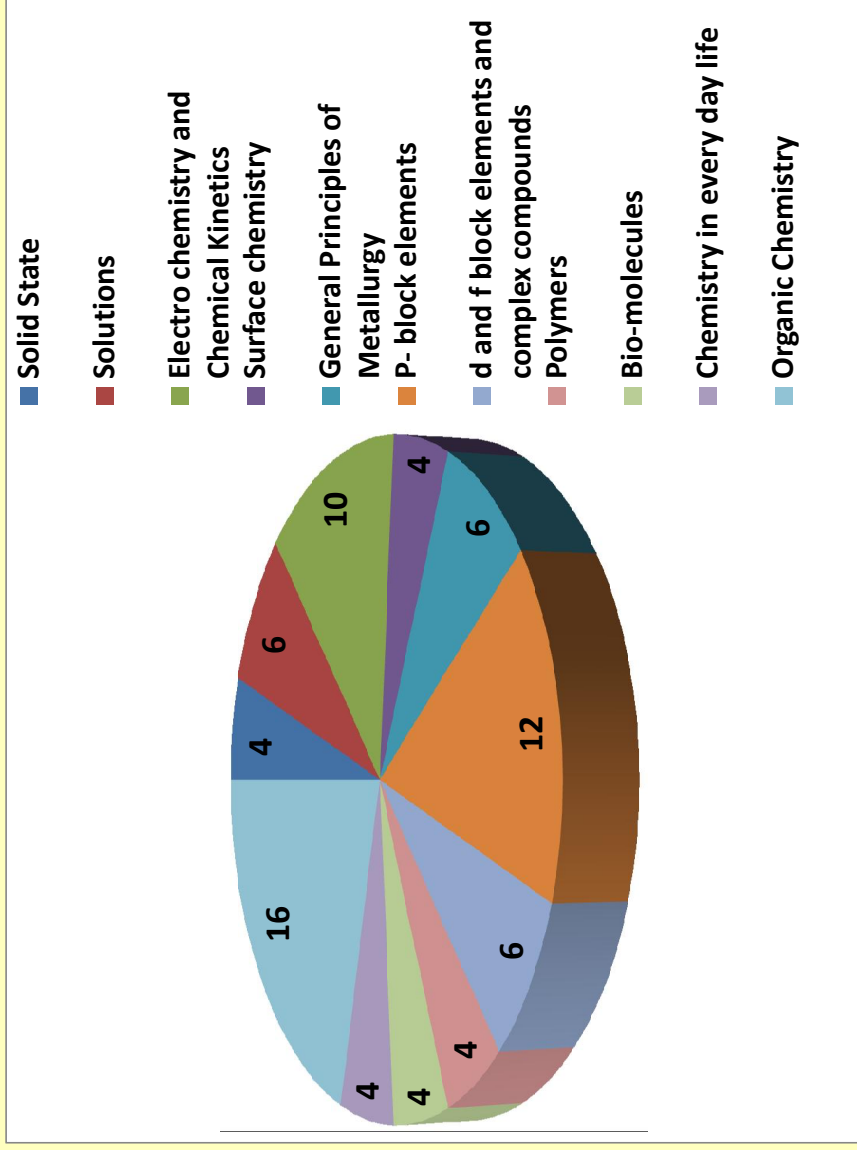91***.Mention the basic methods of modulation.

92***.Which type of communication is employed in Mobile phones?

	Questions to be practice	Student can attempt (min Questions)	Student can get (Min Marks)
LAQ's	10	2	16
SAQ's	49	5	20
VSAQ's	137	7	14
Total	**196**	**14**	**50**

Legend (pie chart):
- Solid State
- Solutions
- Electro chemistry and Chemical Kinetics
- Surface chemistry
- General Principles of Metallurgy
- P- block elements
- d and f block elements and complex compounds
- Polymers
- Bio-molecules
- Chemistry in every day life
- Organic Chemistry

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	Solid State	-	3	9	4
2	Solutions	-	1	13	6
3	Electro chemistry and Chemical Kinetics	3	8	15	10
4	Surface chemistry	-	5	11	4
5	General Principles of Metallurgy	-	6	6	6
6	P- block elements	5	6	22	12
7	d and f block elements and complex compounds	-	6	11	6
8	Polymers	-	2	16	4
9	Bio-molecules	-	6	7	4
10	Chemistry in every day life	-	1	13	4
11	Organic Chemistry	2	5	14	16
	TOTAL	10	49	137	76

SR.INTER - CHEMISTRY_IMP_QUESTIONS

LAQ'S (8 MARKS QUESTIONS)

ELECTRO CHEMISTRY

1***. What are galvanic cells ? Explain the working of a galvanic cell with a neat sketch taking Daniel cell as example.

2***. What is electrolysis? Give Faraday first law, Faraday second law?

CHEMICAL KINETICS

3***.Give the detailed account of the collision theory of reaction rates of bimolecular gaseous reaction.

NUMERICAL DATA BASED AND CONCEPT ORIENTED QUESTIONS

*. A reaction has a half -life of 10 minutes. Calculate the rate constant for the first order reaction.

P - BLOCK ELEMENTS

GROUP 15 ELEMENTS

4***. How is ammonia manufactured by Haber's process? Explain the reactions of ammonia with

a) $ZnSO_{4(aq)}$ b) $CuSO_{4(aq)}$ c) $AgCl_{(s)}$

5**. How is nitric acid manufactured by Ostwald's process? How does it react with the following ?

a) Copper   b) Zn   c) S_8 d) P_4

GROUP 16 ELEMENTS

6****.How is ozone prepared from oxygen? Explain its reaction with

a) PbS   b) KI   c) Hg   d) Ag   e) C_2H_4 f) C_2H_2

GROUP 17 ELEMENTS

7***.How is chlorine prepared in the laboratory?How does it react with the following?

a) Iron   c) acidified $FeSO_4$ d) Iodine   e) H_2S f) $Na_2S_2O_3$

8***. How is chlorine prepared by electrolytic method?

Explain its reaction with a) NaOH b) NH_3 under different conditions.

Alcohols, Phenols, Ethers

9***.With a suitable example write equations for the following.

**i) Kolbe's reaction   ***ii) Reimer – Tiemann reaction ***iii) Williamsons ether synthesis

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

10***.Describe the following

i) Acetylation   ii) Cannizaro reaction

iii) Cross aldol condensation   iv) Decarboxylation

SAQ'S (4 MARKS QUESTIONS)

SOLID STATE

1. Explain similarities and differences between metallic and ionic crystals.
2*. Derive Bragg's equation.
3.* Describe the two main types of semi-conductors and contrast their conduction mechanism?

SOLUTIONS

4*. what is relative lowring of vapour pressure? How it is useful to determine the molar mass of a solute?

ELECTRO CHEMISTRY

5*. What is metallic corrosion ? Explain it with respect to Iron corrosion

6***.State and explain Kohlrausch's law of independent migration of ions along with applications?

7. What are primary and secondary batteries? Give one example for each.
8. Give the construction and working of SHE with neat diagram?

CHEMICAL KINETICS

9**. What is half-life $(t \frac{1}{2})$ of a reaction? Derive the equations for the 'half-life' value of zero and first order reactions.
10*. What is the molecularity of reaction? How it is different from the order of reaction? Name one bi-molecular and Tri-molecular gaseous reaction?
11*. Derive Integrated rate equation of zero order nd 1st order reaction?
12**.Discuss the effect of catalyst and Temp on the kinetics of chemical rxn with diagram?

SURFACE CHEMISTRY

13***.What is catalysis ? How is catalysis classified? Give two examples for each type of catalysis.

14***. What are different types of adsorption? Give any 4 difference between characteristics of these different types.

15**. What are emulsions. How are they classified. Describe the applications of emulsions?

16***. What are micelles? Discuss the mechanism of micelle formation and cleaning action of soap?

17***. How are colloids classified on the basis of interaction between dispersed phase and dispersed medium?

GENERAL PRINCIPLES OF METALLURGY

18***. Giving examples to differentiate roasting and calcination.
19*. Outline the principles of refining of metals by the following methods.
    **a) Zone refining   *b) Electrolytic refining   **c) Poling   d) Vapour phase refining
20***.Expalin the purification of sulphide ore by froth floatation method.
21*. How is copper extracted from copper pyrites?
22**.Explain briefly the extraction of aluminium from bauxite
23*. Explain the extraction of zinc from zincblende?

P - BLOCK ELEMENTS

GROUP 15 ELEMENTS

24***.How does $PC1_5$ react with the following?
    a) Water   b)C_2H_5OH c) CH_3COOH d) Ag

GROUP 16 ELEMENTS

25**. Describe the manufacture of H_2SO_4 by contact process.

GROUP 17 ELEMENTS

26**. What are interhalogen compounds? Give some example to illustrate the definition. How are they classified?

d AND f BLOCK ELEMENTS & COORDINATION COMPOUNDS

27. What are interstitial compounds? How are they formed? Give two examples.

28***. Explain Werner's theory of coordinate compounds with suitable examples.

29.*. Explain the terms i) Ligand
   ii) Coordination number   iii) Coordination entity   iv) Central metal atom/ion

30**. Give the oxidation numbers of the central metal atoms in the following complex entities
   i) $[Ni(CO)_4]$ ii) $[Co(NH_3)_6]^{3+}$ iii) $[Fe(CN)_6]^{4-}$ and   iv) $[Fe(C_2O_4)_3]^{3-}$

31**. Using IUPAC norms write the systematic names of the following:
   i) $[Co(NH_3)_6]Cl_3$ ii) $[Pt(NH_3)_2Cl(NH_2 CH_3)]C$ liii) $[Ti(H_2O)_6]^{3+}$ and iv) $[NiCl_4]^{2-}$

32. Explain geometrical isomerism in coordination compounds giving suitable examples.

GROUP 18 ELEMENTS

33**. How are xenon flurides XeF_2, XeF_4 and XeF_6 botained ?

34**. How are XeO_3, XeO_2F_2 and $XeOF_4$ prepared ? along molecular shape

35*. Explain the reaction of the following with water
   a) XeF_2 b) XeF_4 XeF_6

POLYMERS

36***. Classify the following into addition and condensation polymers.
   i) Terylene   ii) bakelite   iii) Poly Vinyl chloride   iv) Polythene

37***. Write the names and structures of the monomers of the following polymers
   **i) Buna –S **ii) Buna –N   iii) Dacron   iv) Neoprene

BIOMOLECULES

38*. Write a brief note on the structure of glucose

39*. What are hormones? Give one example for each.
   i) steriod hormones
   ii) Poly peptide hormones
   iii) amino acid derivatives.

40***. Give the sources of the following vitamins and name the diseases caused by their deficiency
   a) A   b) D   c) E and   d) K

41**. What are the essential and non-essential amino acids? Give one example for each.

42. Write the importance of carbohydrates

43*. Define the following as related to proteins.
   i) Peptide linkage   ii) Primary structure   iii) Denaturation

CHEMISTRY IN EVERYDAY LIFE

44***.What are analgesics ? How are they classified ? Give examples

HALOALKANES AND HALOARENES

45***. Explain the mechanism of SN^1 and SN^2 reaction with one example.

46**. Define the following:

i) Racemic mixture   ii) Retention of configuration   iii) Enantiomers.

Alcohols, Phenols, Ethers

47***. Explain the acidic nature of phenols and compare with that of alcohols.

ORGANIC COMPOUNDS CONTAINING NITROGEN

48.   Write the mechanism of Hoffmann bromamide reaction.

49***. Explain the following name reactions?

i) Sandmeyer reaction   ii) Getterman reaction

VSAQ'S (2 MARKS QUESTIONS)
SOLID STATE

1.*   What is the coordination number of atoms in a cubic close-pack structure?

2.*   What is the coordination number of atoms in a body-centrered cubic structure?

3.   How do you distinguish between crystal lattice and unit cell?

4*.   How many lattice points are there in one unit cell of face-centered cubic lattice

5*.   What is Schottky defect?

6*.   What is Frenkel defect?

7*.   What are f– centers?

8.   How many lattice points are there in one unit cell of body centered cubic lattice

9.   What are octahedral and tetrahedral voids?

SOLUTIONS

10*. Define molarity.

11*. Define molality.

12*. Define mole fraction.

13***.State Raoult's law.

14**. State Henry's law.

15.   What is Ebullioscopic constant?

16.   What is Cryoscopic constant?

17**. Define osmotic pressure.

18***.What are isotonic solutions?

19***.What is Van't Hoff's factor (i) and how is it related to 'α' in the case of a binary electrolyte. (1:1)

20.***.Calculate the molefraction of H_2SO_4 in a solution containing 98% H_2SO_4 by mass.

21.   What is an ideal solution ?

22*.   A solution of glucose in water is labelled as 10% w/w. What would be the molarity of the solution?

ELECTRO CHEMISTRY

23. Write the cell reaction taking place in the cell
    $Cu(s) / Cu^{2+}(aq) // Ag^{+}(aq) / Ag(s)$

24***. What is Nernst equation ? Write the equation for an electrode with electrode reaction
    $M^{n+}(aq) + ne^{-} \rightleftharpoons M(s)$.

25.* How is Gibbs energy (G) related to the cell emf (E) mathematically?

26*. Define molar conductivity $\wedge_m$ and how is it related to conductivity (k)?

27**. Find the amount of Cu deposited at electrode by passing 2 amp electricity in 10 min from $CuSO_4$ solution?

CHEMICAL KINETICS

28*. Define the speed or rate of a reaction.

29**. Define Order of a reaction. Illustrate your answer with an example.

30**. Give the units of rate constants for Zero, first order and second order reactions

31***. Define molecularity of a reaction. illustrate your answer with an example.

32*. Give two examples for zero Order reactions.

33. Give two examples for gaseous first order reactions

34***. What is half -life of a reaction? Illustrate your answer with an example.

35***. What are pseudo first order reactions? Give one example.

36**. What is the effect of temperature on the rate constant?

37*. What is rate law? Illustrate with an example?

SURFACE CHEMISTRY

38**. Define "Promoters" and "poisons" in the phenamenon of catalysis.

39***. Name the dispersed phase and dispersion medium in the following colloidal systems
    (i) fog   (ii) smoke   (iii) milk

40***. What is Tyndall effect?

41***. What is Brownian movement ?

42*. What is electrokinetic potential or zeta potential?

43*. What is electrophoresis?

44***. What is coagulation?

45*. State Hardy–Schulze rule

46***. What is an emulsion? Give two examples.

47***. What is an emulsifing agent?

48. Define Gold Number?

GENERAL PRINCIPLES OF METALLURGY

49*. What is the role of cryolite in the metallurgy of aluminium?

50***. Give the composition of the following alloys
    a) Brass   b) Bronze   c) German silver

51*. Explain the terms gangue and slag

52*. What is matte ? Give its composition.

53**. What is blister copper? Why is it so called?

54.   What is flux? Give an example.

P - BLOCK ELEMENTS

GROUP 15 ELEMENTS

55***. What is allotropy? Explain the different allotropic forms of phosphorus.

56***. What is inert pair effect?

57*. PH_3 is a weaker base than NH_3 - Explain.

58**. NH_3 forms hydrogen bonds but PH_3 does not - Why?

59**. Ammonia is good complexing agent. Explain with an example

60**. Iron becomes passive in Con. HNO_3 Why?

61.   Give an example of
   a) Acidic oxide of phosphorus
   b) Neutral oxide of Nitrogen

GROUP 16 ELEMENTS

62***. Why is H_2O a liquid while H_2S is a gas?

63***. What is tailing of mercury? How is it removed?

64.   Why are Gp 16 elements called chalcogens

65*. SO_2 can be used as an antichlor. Explain.

66*. Explain the structure of SF_4 and SF_6

GROUP 17 ELEMENTS

67**. Write the reactions of F_2 and Cl_2 with water.

68***. Electron gain enthalpy of fluorine is less than that of chlorine -explain.

69*. Bond dissociation enthalpy of F_2 is less than that of Cl_2-explain.

70***. What happens when Cl_2 reacts with dry slaked lime?

71**. What is aqua regia ? Write its equation with gold and platinum

72*. How is chlorine manufactured by Deacon's method?

73**. HF is liquid while HCl is gas. Explain?.

GROUP 18ELEMENTS

74***. List out the uses of neon

75***. Write any two uses of argon

76**. In Modern diving appratus, a mixture of He and O_2 is used-Why?

d AND f BLOCK ELEMENTS & COORDINATION COMPOUNDS

77*. What are transition elements? Give example

78**. Write the electronic configuration of chromium (Cr) and copper (Cu).

79***. Why Zn^{2+} is diamagnetic where as Mn^{2+} is paramagnetic?

80***.Calculate the 'spin only' magnetic moment of $Fe^{2+}_{(aq)}$ ion.

81**.What is an alloy? Give example.

82*. What is mischmetall? Give its composition and uses.

83*. What is a ligand?

84***.How many moles of AgCl is precipitated when 1 mole of $CoCl_3$ is treated with $AgNO_3$ solution?

85***.What is an chelate ligand? Give example.

86***.What is an ambidentate ligand? Give example.

87**.$CuSO_4, 5H_2O$ is blue in colour where as anhydrous $CuSO_4$ is colourless. Why?

POLYMERS

88**. Define the terms monomer and polymer.

89*. What is Polymerization? Give an example of polymerization reaction.

90**. Give one example each for synthetic and semi–synthetic polymers.

91**. What is addition polymer? Give example.

92***.What is condensation polymer? Give example.

93*. What are copolymers? Give example.

94***.What are Elastomers? Give example.

95***.What are thermoplastic polymers? Give example.

96***.What are thermosetting polymers? Give example.

97***.What is Ziegler –Natta catalyst?

98***.What is the difference between Buna –N and Buna –S?

99**.What is PDI (Poly Dispersity Index)?

100*.What is Vulcanisation of rubber?

101***.What is bio–degradable polymer? Give one example of a bio–degradable polyester?

102***.What is PHBV ? How is it useful to man?

103***.Give the structure of Nylon –2– Nylon –6?

BIOMOLECULES

104***.Why are sugars classified as reducing & non reducing sugars?

105**. What are amino acids? Give two examples.

106*.What are reducing sugars?

107*. Differentiate between gobular and fibrous proteins?

108*. What is zwitter ion? Give one example

109*. What are non-reducing sugars

110. Write two Methods of preparation of Glucose?

CHEMISTRY IN EVERYDAY LIFE

111***.What are antacids? Give example.

112**.What are antihistamines? Give example.

113***. What are tranquilizers? Give example.

114*. What are barbiturates?

115***. What are antimicrobials?

116***. What are antibiotics? Give example.

117***. What are antiseptics? Give example.

118. What are disinfectants? Give example.

119*. What is tincture of iodine? What is its use?

120***. What are food preservatives ? Give example

121. What is saponification?

122***. What is the difference between a soap and a synthetic detergent?

123**. What are artificial sweetening agents? Give examples?

HALOALKANES AND HALOARENES

124**. What is the stereochemical result of S_N^1 and S_N^2 reactions

125*. Explain the Grignard reagents preparation with suitable example.

126***. How will you carry out the following conversions?

    i) Ethane to bromomethene   ii) Toluene to benzyl alcohol

127*. What is wurtz Rxn

128*. What is Wurtz fitting Rxn

129. What is fitting Rxn

Alcohols, Phenols, Ethers

130. Give the reagents used for the preparation of phenol from chlorobenzene
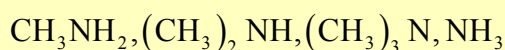
ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

131***. Write the reaction showing α – halogenation of carboxylic acid and give its name (H.V.Z reaction)

132***. Compare the acidic strength of acetic, chloroacetic acid, benzoic acid and phenol.

ORGANIC COMPOUNDS CONTAINING NITROGEN

133***. Gabriel phthalimide synthesis exclusively forms primary amines only. Explain

134*. Arrange the following bases in increasing order of their basic strength. Aniline, p–nitroaniline and p–toluidine

135***. Write equation for Carbylamine reaction of any one aliphatic amine.

136**. Give structures of A, B and C in the following reaction.

$$C_6H_5N_2Cl \xrightarrow{\boxed{CuCN}} A \xrightarrow{\boxed{H_2O/H^+}} B \xrightarrow{\boxed{NH_3,\Delta}} C$$
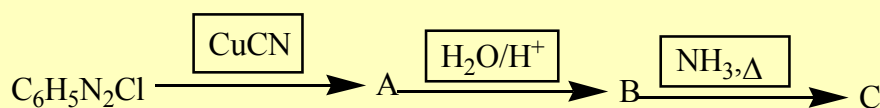
137**. Compare the basic strength of the following compounds.

$$CH_3NH_2, (CH_3)_2 NH, (CH_3)_3 N, NH_3$$

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