7

NEET/IIT/JEE FOUNDATION COURSE

PREFACE

This book is especially for the students to get ready for competitive exams. The objective of this book is to make the students get ready for future.

At the same time it guides the students to face the challenges in maths and science in various fields.

It places emphasis on developing, thinking and reasoning skills among students, by connecting mathematics and science curriculum with real life situations.

This book is compiled with four chapters in Mathematics and four chapters in science. Each chapter is divided under different heads.

KEY FEATURES

UNDERSTANDING

Students will be able to

- **Understand the concept of different topics with related formulas, equations and concepts**.

APPLICATION

- **Apply effectively with the help of the Guidelines given**.

ANALYSIS

- **Analyze the concepts using the given Formula and equations**.

OUTCOME

Get ready for competitive exams in future.

"**Education is the kindling of a flame,**

Not the

Filling of a vessel"

7

IIT/JEE FOUNDATION COURSE

MATHEMATICS

Mathematics Is Not About Numbers, Equation, Computations, Or Algorithms: It Is About Understanding.

CONTENT

S.NO	TOPICS	PAGE. NO
1	POWERS AND EXPONENTS	11 - 24
2	ALGEBRA	25 - 38
3	BODMAS	39 - 50
4	MENSURATION	51 - 69

UNIT-1

POWERS AND EXPONENTS

INTRODUCTION

EXPONENT is used to express very large number and very small numbers in standards form.

Very small numbers can be expressed in standard for musing negative exponents.

Eg: 1million=10^{-6}m = $\frac{1}{100000}$m If

x, y, a, b are rational number then

i) $x^a \div x^b = x^{a-b}$

ii) $x^{a*}x^a = (xy)^a$

iii) $(\frac{x}{y})^a = \frac{x^a}{y^a}$

iv) $(x^a)^b = x^{ab}$

v) $x^a xy^{-a} = \frac{x^a}{y^a}$

vi) $x^0 = 1$

vii) $x^{-1} = \frac{1}{x}$

Example:

1. simplify: $3^5 \div 3^{-6}$

Solution:

Form $\frac{3^5}{3^6} = (3^{5+6}) = 3^{11}$

2. Find the value of $\left(\frac{2}{5}\right)^{-5}$

<u>Solution:</u>

$$= \frac{1}{\left(\frac{2}{5}\right)^5} = \left(\frac{5}{2}\right)^5 = \frac{5\times5\times5\times5\times5}{2\times2\times2\times2\times2} = \frac{3125}{32}$$

3. Find the value of 4^{-3}

<u>Solution:</u> $4^{-3} = \frac{1}{4^3} = \frac{1}{4\times4\times4} = \frac{1}{64}$

4. Find the value of $(2/5)^{-5}$

<u>Solution:</u> $(2/5)^{-5} = \frac{1}{(2/5)^{-5}} = (5/2)^5$

$$= \frac{5^5}{2^5} = \frac{5\times5\times5\times5\times5}{2\times2\times2\times2\times2} = \frac{3125}{32}$$

5. Evaluate: $(\sqrt{4})^{-3}$

<u>Solution</u>: $(\sqrt{4})^{-3} = (4^{1/2})^{-3} = 4^{-3/2} = (1/4)^{3/2}$

<u>EXERCISE: 1.1</u>

1. The value of 3^0 is _____

   a) 0 b) 3 c) 1 d) none of these

   Ans: c) 1

2. The value of $\frac{1}{3^2}$ is equal to _____

   a) 1/9 b) 1 c) 6 d) 1/3

   Ans: a) 1/9

3. In simplified form of $(3^0+4^0+5^0)^0$ is equal to _____

a) 12 b) 3 c) 12 d) 1

Ans: d) 1

4. 1 micron is equal to _____

a) 10^{-6} b)10^5 c)10^{15} d)10^6

Ans: a) 10^{-6}

5. The value of $(1/6)^2$ is _____

a) 1/6 b) $1/3^2$ c) $1/6^2$ d)1/66

Ans: c) $1/6^2$

6. Evaluate $a^2 \times a^3 \times a^{-5}$_____

a) 0 b)1 c)2 d)-1

Ans: b) 1

7. Find the value of $(4^0+4^{-1})2^2$ ----------

a) -5 b) 0 c) 2 d) 5

Ans: d) 5

8. Simplify $3^5 \div 3^{-6}$ _____

a) 3^{-11} b) 3^{-12} c) 3^{-13} d) 3^{11}

Ans: d) 3^{11}

9. Find the value of x, $2^{10} \div 2^4 = 2^{-2} \times 2^{2x}$ _____

a)4 b) -4 c) 5 d) 6

Ans: a) 4

10. Express 8^2 as a power with base 2_____

a) 2^9 b) 2^{-9} c) 2^6 d) 3^{-8}

Ans: c) 2^6

11. $2^2 \times 2^3 \times 2^4$ equal to _____

a) 2^{24} b) 2^{-5} c) 2^9 d) 2^{-9}

Ans: c) 2^9

12. $\frac{5^4}{5^2}$ is equal to _____

a) 5^6 b) 5^{-6} c) 5^{-2} d) 5^2

Ans: d) 5^2

13. $3^2 \times 4^2$ is equal to _____

a) 121 b) 49 c) 144 d) 156

Ans: c) 144

14. $(5^7/5^3)$ will give the value.

a) 5^4 b) 5^0 c) 5^2 d) 5^1

Ans: a) 5^4

15. $100^0+20^0+5^0$ is equal to _____

a) 125 b) 25 c) $\frac{1}{125}$ d) 3

Ans: d) 3

16. If $(-3)^{m+1} \times (-3)^5 = (-3)^7$ the value of m is _____

a) 5 b) 7 c) 1 d) 0

Ans: c) 1

17. What is the value $(4)^2/2$?

a) 16 b) 7 c) 1 d) 8

Ans: b) 8

18. $(-1)^{20}$ is equal to _____

a) 11111111 b) 1 c) -1 d) 0

Ans: b) 1

19._____is added to 24^2 to get 25^2

a) 42 b) 52 ` c) 62 d) 49

Ans: d) 49

20. Find the value of $(-2)^5 \times (-2)^{-3}$

a) 4 b) -4 c) 8 d) -8

Ans: a) 4

21. Simplify :($35 \div 3^8$)

a) 3^{-5} b) 3^5 c) 3^{-3} d) 3^8

Ans: c) 3^{-3}

22. Find x, so that $(-7)^{x+2} \times (-7)^5 = (-7)^{10}$

a) -3 b) 3 c) -4 d) 4

Ans: b) 3

23. Find the value of $\frac{3^2}{3^{-2}}$

a) 9 b) 27 c) 54 d) 81

Ans: d) 81

24. Light travels at 1.86×10^5 miles per second is equal to _____

a) 18600 b) 186000 c) 1860000 d) 18600000

Ans: b) 186000

25. The standard form of 2×10^{-4} is

a) 0.0002 b) 0.002 c) 0.0200 d) 0.020

Ans: a) 0.0002

26. Evaluate: $(3^{-1}+4^2+5^{-3})^0$

a) 0 b) 1 c) 2 d)3

Ans: b) 1

27. If $\frac{10^x}{10^{-3}}=10^9$, then x is _____

a) 4 b) 5 c) 6 d) 7

Ans: c) 6

28. If $2^{m-1}+2^{m+1}= 640$, then find m.

a) 6 b) 7 c) 8 d) 9

Ans: c) 8

29. By what number should $(-4)^{-1}$ be multiplied so that the product becomes 10^{-1}?

a) $\frac{2}{3}$ b) $\frac{-2}{5}$ c) $\frac{5}{2}$ d) $\frac{-5}{2}$

Ans: b) $\frac{-2}{5}$

30. Simplify: $4(10 + 15 \div 5 \times 4 - 2 \times 2)$

a) 6 b) 72 c) 8 d) 9

Ans: b) 72

Can you solve this puzzle :

WORK SHEET

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)

Set

Roll Number

Subject

Mobile Number

Test ID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D
39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D
56	A	B	C	D
57	A	B	C	D
58	A	B	C	D
59	A	B	C	D
60	A	B	C	D
61	A	B	C	D
62	A	B	C	D
63	A	B	C	D
64	A	B	C	D
65	A	B	C	D
66	A	B	C	D
67	A	B	C	D
68	A	B	C	D
69	A	B	C	D
70	A	B	C	D
71	A	B	C	D
72	A	B	C	D
73	A	B	C	D
74	A	B	C	D
75	A	B	C	D

76	A	B	C	D
77	A	B	C	D
78	A	B	C	D
79	A	B	C	D
80	A	B	C	D
81	A	B	C	D
82	A	B	C	D
83	A	B	C	D
84	A	B	C	D
85	A	B	C	D
86	A	B	C	D
87	A	B	C	D
88	A	B	C	D
89	A	B	C	D
90	A	B	C	D
91	A	B	C	D
92	A	B	C	D
93	A	B	C	D
94	A	B	C	D
95	A	B	C	D
96	A	B	C	D
97	A	B	C	D
98	A	B	C	D
99	A	B	C	D
100	A	B	C	D

Candidate's Signature

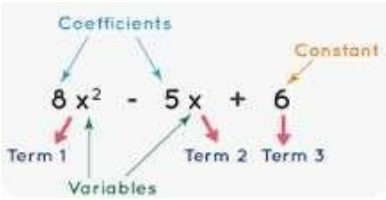
Invigilator's Signature

UNIT-2

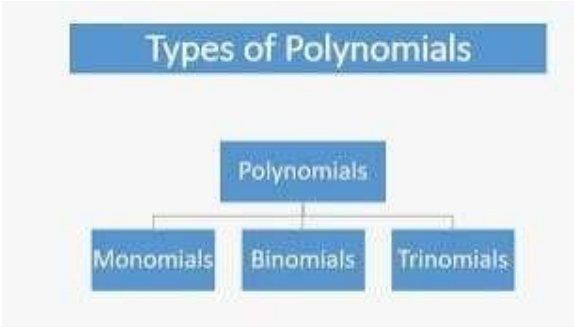
ALGEBRA

An algebraic expression (or) a variable expression is a combination of terms by the operations such as addition, subtraction, multiplication, division, etc.

For example, let us have a look at the expression 5x+7.Thus, we can say that 5x+7 is an algebraic expression.



TYPES OF POLYNOMIAL:



They are monomial, binomial, trinomial. Based on the degree of a polynomial, it can be classified into 4 types.

They are zero polynomial, linear polynomial, quadratic polynomial, cubic polynomial.

Monomial:

Monomial is a polynomial which has only one term.

Ex: $9x^3yz$.

Binomial:

Binomial is a polynomial with only two terms Ex: x+2 where x and are two Spectre term.

Trinomial:

An expression which contains only three terms is called a trinomial.

Ex: m^2-n^2+3.

Addition and subtraction of algebraic expression:

(i) Subtract 7ab from 9ab

$$9ab-7ab = 2ab$$

Finding value of an expression:

(ii) If x=3 then find the value of 2x+3

$$2\times3+3 = 6+3 = 9$$

ALGEBRAIC IDENTITIES

Algebra identities which hold the for all the value of the valuables are called identities.

1. $(x+a)(x+b) = x^2+x(a+b)+ab$

2. $(a+b)^2 = a^2 + 2ab + b^2$

3. $(a-b)^2 = a^2 - 2ab + b^2$

4. $(a+b)(a-b) = a^2 - b^2$

Exercise:2.1

1. How many terms are there in the expression $2x^2y$?

   a) 1 b)2 c) 3 d) 4

   Ans: a) 1

2. How many terms are there in the expression 2y+5?

   a) 1 b) 2 c) 3 d) 4

   Ans: b) 2

3. Which type of an expression is 1.2ab−2.4b+3.6a?

   a) Monomial b) binomial c) trinomial d) none

   Ans: c) trinomial

4. What is the co-efficient of x in the expression 4x+3y?

   a) 1 b) 2 c) 3 d) 4

   Ans: d) 4

5. What is the co-efficient of y^2 in the expression $3y^2+4n$?

   a) 1 b) 2 c) 3 d) 4

   Ans: c) 3

6. Which are the following pairs of terms are like terms?

a) x, 2x b) $\left(\frac{1}{7}\right) xy$ c) Z^2,y d) Z^2,8

Ans: a) x, 2x

7. Which of the following pairs of terms are unlike terms?

a) $-^{p2q2}$,12^{q2p2} b) 41,100 c) none d) $(-4y)^{x2}$, $(-4x)^{y2}$

Ans: d) $(-4y)^{x2,}$ $(-4x)^{y2}$

8. Add: a+b-1, b-a+1, 1-2b

a) 1 b)-1 c) 2 d)-2

Ans: a) 1

9) Simplify: p + (p-q) +q+(q-p)

a) p b) q c) p + q d) p-q

Ans: c) p + q

10. Subtract: -xy from xy.

a) Xy b) 2xy c) 3xy d) 4xy

Ans: b) 2xy

11. Find the value of the expression x+2 for x= -2.

a) 0 b) 1 c) -2 d) 2

Ans: a) 0

12. Find the value of the expression a^2+ab+1 for a=0 b=1

a) 0 b) 1 c) -1 d) 2

Ans: b) 1

13. _____ can take various values.

a) Variable b) expression c) term d) none of these

Ans: a) variable

14. $(a-b)^2$ is equal to _____.

a) a^2+b^2-2ab b) a^2+b^2+2ab c) a^2+b^2 d) 2ab

Ans: a) a^2+b^2-2ab

15. The value of x^2-5, at x=-1 is _____.

a) -2 b) -1 c) -4 d) -5

Ans: c) -4

16. Which of the following is the value of $\left(x+\frac{1}{2}\right)^2$

a) $x^2+\frac{1}{x^2}$ b) $x^2-\frac{1}{x^2}$ c) $x^2+\frac{1}{x^2}+2$ d) $x^2+\frac{1}{x^2}+2x$

Ans: c) $x^2+\frac{1}{x^2}+2$

17. Using identities, evaluate 98^2.

a) 9604 b) 99607 c) 99609 d) 99611

Ans: a) 9604

18. If a-b =3 and a^2+b^2 =29, find the value of ab.

a) 10 b) 12 c) 15 d) 18

Ans: a) 10

19. If $x^2-y^2=16$ and (x+y) = 8 then (x-y) is _____.

a) 8 b) 3 c) 2 d) 1

Ans: c) 2

20. Find the value of $(3a+4c)^2$ is _____.

a) $9a^2-24ac+16c^2$ b) $9a^2-24ac-16c^2$

c) $9a^2-24ac-16c^2$ d) $9a^2+24ac+16c^2$

Ans: d) $9a^2+24ac+16c^2$

21. Simplify: (3x+5y) (3x-5y)

a) $9x^2+25y^2$ b) $9x^2-25y^2$ c) $9x^2-5y^2$ d) $9x^2+5y^2$

Ans: b) $9x^2-25y^2$

22. Expand: y^2-16

a) (y+4)(y-4) b) (y+4)(y+4) c) (y-4)(y-4) d) 4y

Ans: a) (y+4)(y-4)

23. Find the value of $(998)^2$ is_____.

a) 996044 b) 996004 c) 996040 d) 99800

Ans: b) 996004

24. Find the product of (2x+3)(2x-4) is_____.

a) $4x^2-2x-12$ b) $4x^2+2x-12$ c) $4x^2-2x+12$ d) $4x^2+2x+12$

Ans: a) $4x^2-2x-12$

25. Simplify: (5x+3)(5x+4)

a) $25x^2+35x-12$ b) $25x^2-35x-12$
c) $25x^2-35x+12$ d) $25x^2+35x+12$

Ans: d) $25x^2+35x+12$

26. Simplify: $\frac{p^2}{p^5}$

a) p^2 b) $\frac{1}{p^3}$ c) $\frac{1}{p^4}$ d) p^5

Ans: b) $\frac{1}{p^3}$

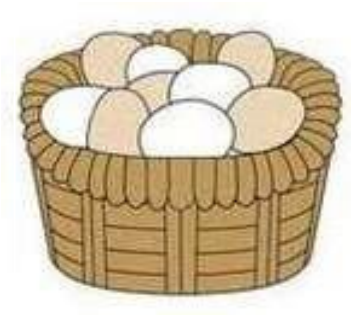
27. Expand: $(105)^2$

a) 11,025 b) 11,205 c) 1125 d) 1000

Ans: a) 11,025

Can you solve this puzzle?

1. There is an empty basket that is one feet in diameter. Can you tell me the total number of eggs that you can put in this empty basket?



<u>WORK SHEET</u>

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)	Set	Roll Number	Subject
	A B C D	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Mobile Number	Test ID
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

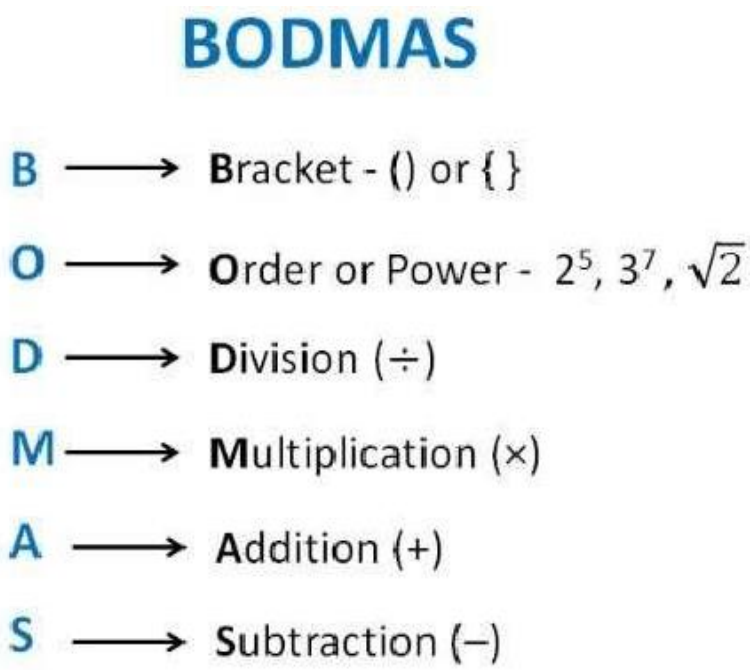
1	A	B	C	D	26	A	B	C	D	51	A	B	C	D	76	A	B	C	D
2	A	B	C	D	27	A	B	C	D	52	A	B	C	D	77	A	B	C	D
3	A	B	C	D	28	A	B	C	D	53	A	B	C	D	78	A	B	C	D
4	A	B	C	D	29	A	B	C	D	54	A	B	C	D	79	A	B	C	D
5	A	B	C	D	30	A	B	C	D	55	A	B	C	D	80	A	B	C	D
6	A	B	C	D	31	A	B	C	D	56	A	B	C	D	81	A	B	C	D
7	A	B	C	D	32	A	B	C	D	57	A	B	C	D	82	A	B	C	D
8	A	B	C	D	33	A	B	C	D	58	A	B	C	D	83	A	B	C	D
9	A	B	C	D	34	A	B	C	D	59	A	B	C	D	84	A	B	C	D
10	A	B	C	D	35	A	B	C	D	60	A	B	C	D	85	A	B	C	D
11	A	B	C	D	36	A	B	C	D	61	A	B	C	D	86	A	B	C	D
12	A	B	C	D	37	A	B	C	D	62	A	B	C	D	87	A	B	C	D
13	A	B	C	D	38	A	B	C	D	63	A	B	C	D	88	A	B	C	D
14	A	B	C	D	39	A	B	C	D	64	A	B	C	D	89	A	B	C	D
15	A	B	C	D	40	A	B	C	D	65	A	B	C	D	90	A	B	C	D
16	A	B	C	D	41	A	B	C	D	66	A	B	C	D	91	A	B	C	D
17	A	B	C	D	42	A	B	C	D	67	A	B	C	D	92	A	B	C	D
18	A	B	C	D	43	A	B	C	D	68	A	B	C	D	93	A	B	C	D
19	A	B	C	D	44	A	B	C	D	69	A	B	C	D	94	A	B	C	D
20	A	B	C	D	45	A	B	C	D	70	A	B	C	D	95	A	B	C	D
21	A	B	C	D	46	A	B	C	D	71	A	B	C	D	96	A	B	C	D
22	A	B	C	D	47	A	B	C	D	72	A	B	C	D	97	A	B	C	D
23	A	B	C	D	48	A	B	C	D	73	A	B	C	D	98	A	B	C	D
24	A	B	C	D	49	A	B	C	D	74	A	B	C	D	99	A	B	C	D
25	A	B	C	D	50	A	B	C	D	75	A	B	C	D	100	A	B	C	D

Candidate's Signature

Invigilator's Signature

UNIT- 3

BODMAS



Bracket of division multiplication addition and subtraction

Step:

i) We have to calculate the expression given in the bracket first.

ii) Late we perform the division or multiplication operation (from left to right)

iii) Perform addition or subtraction (from left to right)

Example : $\left(\frac{1}{2}+\frac{1}{4}\right)$ of 16

Solution:

Step: i) Solve the bracket first

$$\frac{1}{2}+\frac{1}{4}=\frac{4+1}{4}=\frac{5}{4}$$

Step: ii) $\frac{5}{4}$ of 16 = $\frac{5}{4}\times 16 = 5\times 4 = 20$

<u>Some examples:</u>

i) Simplification of brackets:

$$\frac{24}{5}\div\frac{3}{5}\text{ of }\frac{5}{1}+\frac{4}{5}\times\frac{3}{10}-\frac{1}{5}$$

Solution:

$$=\frac{24}{5}\div\frac{3}{5}\text{ of }\frac{5}{1}+\frac{4}{5}\times\frac{3}{10}-\frac{1}{5}$$

$$=\frac{24}{5}\div 3+\frac{4}{5}\times\frac{3}{10}-\frac{1}{5}$$

$$=\frac{24}{5}\times\frac{1}{3}+\frac{4}{5}\times\frac{3}{10}-\frac{1}{5}$$

$$=\frac{8}{5}+\frac{12}{50}-\frac{1}{5}$$

$$=\frac{80+12-10}{50}=\frac{92-10}{50}=\frac{82}{50}$$

$$=\frac{82\div 2}{50\div 2}=\frac{41}{25}=1\frac{16}{25}.\quad \textbf{Ans.}$$

ii) Simplify:

(*a*) $20 - (10 - 3 + 2)$ or $20 - (10 - 3 + 2)$

$= 20 - 10 + 3 - 2$ $\quad$ $20 - (7 + 2)$

$= 23 - 12$ $\quad$ $20 - 9$

$= 11$ $\quad$ $= 11$

(*b*) $50 - [20 + \{30 - (20 - 5)\}]$

$= 50 - [20 + \{30 - 15\}]$

(*Solving*: $20 - 5 = 15$)

$= 50 - [20 + 15]$

(*Solving*: $30 - 15 = 15$)

$= 50 - 35$ (*Solving*: $20 + 15 = 35$)

$= 15$ (*Solving*: $50 - 35 = 15$)

EXERCISE: 3.1

1. Solve 8+9÷9+5×2-7

a) 10 b) 12 c) 1 d) 70

Ans: b) 12

2. $[25 - 3(6 + 1)] \div 4 + 9$

a) 4/3 b) 25/13 c) 9 d) 10

Ans: d) 10

3. Solve $\left(\frac{1}{4} + \frac{1}{8}\right)$ of 64

a) 5 b) 16 c) 24 d) 12

Ans: c) 24

4. Simplify $180 \div \langle (12-6)-(14-12) \rangle$

a) 84 b) 45 c) 18 d) 0

Ans: b) 45

5. Simplify: $3+2^4 \times (15 \div 3)$

a) 80 b) 2^{12} c) 83 d) 5

Ans: c) 83

6. Simplify: $16\left[8-\left\{5-2\left((2-1)+1\right)\right\}\right]$

a) 11 b) 111 c) 112 d) 110

Ans: c) 112

7. Simplify: $[18-2(5+1)] \div 3+7$

a) 8 b) 9 c) 18 d) 10

Ans: b) 9

8. Simplify: 5-2+6÷3

a) 3 b) 1/3 c) 2 d) 5

Ans: d) 5

9. Simplify: $(29-4) \times (6+5)$

a) 155 b) -69 c) 275 d) none

Ans: c) 275

10. Write the missing number to make the calculations correct.

200x? -200 =200

a) 4 b) 100 c) 1 d) 2

Ans: d) 2

11. If $\frac{x}{y} = \frac{3}{4}$ and 8x+5y =22, then find the value of x.

a) 3.2 b) 2.1 c) 2.3 d) 1.5

Ans: d) 1.5

12. Simplify: 10-$\{51 - (71 + 2.8 \div x)\} \times 4.25 \div (0.2)^2$ =306

a) 1.963 b) 2.847 c) 3.562 d) 4.963

Ans: c) 3.562

13. If 2x+3y =34 and $\frac{x+y}{y} + \frac{13}{8}$, then find the value of 6x+4y.

a) 62 b) 58 c) 108 d) 122

Ans: a) 62

14. Simplification: $\frac{6^3+8^3-7^3}{6^2+8^2-7^2}$ = ?

a) $\frac{287}{385}$ b) $\frac{223}{167}$ c) $\frac{385}{51}$ d) $\frac{231}{378}$

Ans: c) $\frac{385}{51}$

15. Simplify : $\frac{16\times9-9\times15}{25\times12+12}$ = ?

a) $\frac{3}{104}$ b) $\frac{4}{104}$ c) $\frac{5}{104}$ d) $\frac{6}{104}$

Ans: a) $\frac{3}{104}$

16. Solve: 6162 + ? + 3330 = 2545.

a) 6946 b) 6947 c) 6948 d) 6949

Ans: b) 6947

17. Simplified form of 160cm divided by 2m is _____.

a) $\frac{4}{5}$ b) $\frac{5}{4}$ c) $\frac{1}{3}$ d) $\frac{3}{5}$

Ans: a) $\frac{4}{5}$

18. The sum of $\frac{3}{11}$ and $\frac{5}{11}$ is _____.

a) $\frac{9}{11}$ b) $\frac{10}{11}$ c) $\frac{8}{11}$ d) $\frac{11}{3}$

Ans: c) $\frac{8}{11}$

19. What is the value of $12\frac{1}{2} + 12\frac{1}{3} + 12\frac{1}{6}$?

a) 36 b) 37 c) 39 d) 38

Ans: b) 37

20. Find the value of x:

$2^3 \times 3^4 \times 1080 \div 15 = 6^x$

a) 4 b) 6 c) 8 d) 2

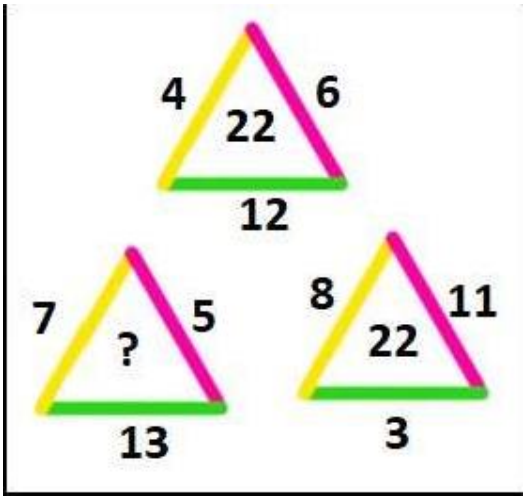
Ans: b) 6

21. Solve: $(81.84 + 118.16) \div 5^3 = 1.2 \times 2 + ?$

a) 0.8 b) -0.8 c) 0.6 d) -0.6

Ans: b) -0.8

Can you solve this puzzle?



<u>WORK SHEET</u>

OMR HOME

A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)

Set

Roll Number

Subject

Mobile Number

Test ID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D
39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D
56	A	B	C	D
57	A	B	C	D
58	A	B	C	D
59	A	B	C	D
60	A	B	C	D
61	A	B	C	D
62	A	B	C	D
63	A	B	C	D
64	A	B	C	D
65	A	B	C	D
66	A	B	C	D
67	A	B	C	D
68	A	B	C	D
69	A	B	C	D
70	A	B	C	D
71	A	B	C	D
72	A	B	C	D
73	A	B	C	D
74	A	B	C	D
75	A	B	C	D

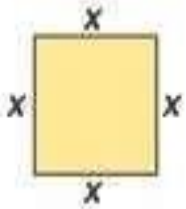
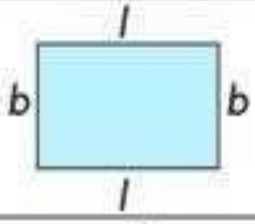
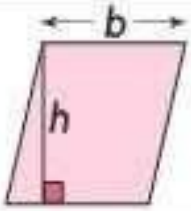
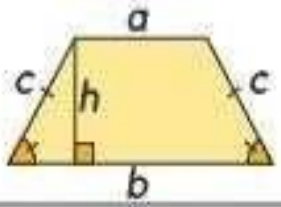
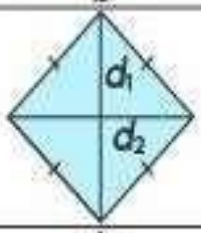
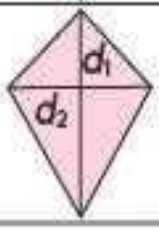
76	A	B	C	D
77	A	B	C	D
78	A	B	C	D
79	A	B	C	D
80	A	B	C	D
81	A	B	C	D
82	A	B	C	D
83	A	B	C	D
84	A	B	C	D
85	A	B	C	D
86	A	B	C	D
87	A	B	C	D
88	A	B	C	D
89	A	B	C	D
90	A	B	C	D
91	A	B	C	D
92	A	B	C	D
93	A	B	C	D
94	A	B	C	D
95	A	B	C	D
96	A	B	C	D
97	A	B	C	D
98	A	B	C	D
99	A	B	C	D
100	A	B	C	D

Candidate's Signature

Invigilator's Signature

UNIT-4

MENSURATION

Quadrilateral		Area Formula
Square		x^2
Rectangle		$l \times b$
Parallelogram		$b \times h$
Trapezoid		$\frac{1}{2}(a + b)h$
Rhombus		$\frac{1}{2} \times d_1 \times d_2$
Kite		$\frac{1}{2} \times d_1 \times d_2$

Mensuration:

Mensuration is the branch of geometry that deals with the measurement in shape.

(i) *Area:*

In geometry, the area can be defined as the space occupied by a flat shape or the surface of an object. The area of a figure is the number of unit squares that cover the surface of a closed figure. The area is measured in square units such as square centimeters, square feet, square inches, etc.

***(ii) Perimeter*:**

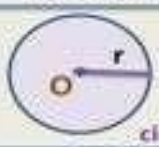
The total length of the boundary of a closed shape is called its perimeter. Hence, the perimeter of that shape is measured as the sum of all the sides. Thus, the perimeter formula is Perimeter (P) = Sum of all the sides.

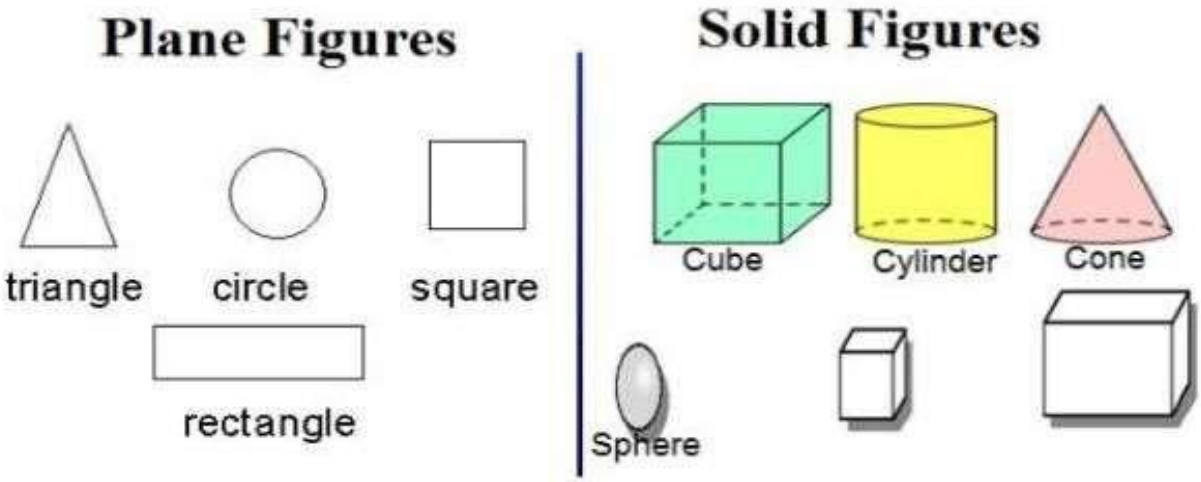
Plane Figures

A flat, closed figure is called a plane figure. A plane figure can be made of straight lines, curved lines, or both straight and curved lines.

Polygons are plane figures that are made of line segments. The point where the sides meet is call the vertex.

Formula	Area	Perimeter
Square	a^2	4a
Rectangle	$l \times b$	$2(l + b)$
Circle	πr^2	$2\pi r$
Triangle	$\frac{1}{2}(b \times h)$	$(a + b + c)$

Figure	Perimeter	Area
Rhombus	P =4a	$A = \frac{1}{2} \times$ (product of lengths of diagonals) $A = \frac{1}{2} \times (d_1 \times d_2)$
 circle	$C = 2\pi r$ $C = \pi d$	$A = \pi r^2$
semicircle	$P = \pi r + 2r$ $P = \pi r + d$	$A = \frac{1}{2} \pi r^2$



Example:

1. Find the area and perimeter of a square whose side in 5cm.

Solution:

Side a = 5 cm

Area of a square = a^2

Area of square = 5^2 = 5x5 = 25sq.cm

Perimeter of a square = 4a sq.

Units Perimeter of a square = 4 x 5 = 20 cm

2. What is the circumference of circle with a radius of 3.5cm.

Solution:

Radius of the circle = 3.5am

C = $2\pi r$ units

= $2\times \frac{22}{7} \times 3.5$ = 22cm.

3. Find the area of the parallelogram if the base is 15cm and height is 10cm

Solution:

b = 15cm; h = 10cm

Area of parallelogram = b x h sq units

A = 15 cmx10cm =150sq.cm

4. Suppose a quadrilateral having a diagonal of length 10cm which divides the quadrilateral into two triangles and the heights of triangles with diagonals as the base are 4 cm and 6cm. Find the area of the quadrilateral?

Solution:

Diagonal, d=10 cm

Height of one triangle h_1 = 4 cm

Height of another triangle h_2=6cm

Area of quadrilateral=½d(h_1+h_2) sq. units

=½ x 10x (4+6)

=5x10= 50 sq cm.

5. The length of the rectangular Field is 100cm it is perimeter is 300cm. Find the breadth?

Solution:

Perimeter of a rectangle = 2l+2b units = 2(l +b)

2(l + b) = 300

2(100 + b) = 300

200+ 2b = 300

2b = 300 –200 = 100cm , b = $\frac{100}{2}$ = 50cm

6. The area of the rectangle is 240sq cm and length is 20cm. Find its breadth.

Solution:

Area of the rectangle = l x b sq units. l = 20

Area = 240sq cm , b = ?

l x b = 240 cm^2

20xb =240cm^2

b $= \frac{240}{20}$ =12cm , b = 12 cm

7. The side of square is 70cm then find its area and perimeter.

Solution:

Side of a square = 70cm

A = side x side

= 70 x 70

A = 4900cm^2

Perimeter = 4x side

= 4x 70=2800cm

8. If the circumference of a circle is 176m then find its area.

Solution:

Circle c = $2\pi r$

$2\pi r$ = 176

$2\times \frac{22}{7} \times r$ =176

$r = \frac{176 \times 7}{44}$ = 28cm

EXERCISE:4.1

1. Area of a triangle with base (b) and height (h)_____.

   a) b×h b) ½ b×h c) 2b×h d) none of these

   Ans: b) ½ b×h

2. Area of the square with side of length "a" is _____.

   a) 2a b) 4a c) a/2 d) a^2

   Ans: d) a

3. The area of a parallelogram with length (l) and breadth (b) is_____.

   a) ½ ×l×b sq. units b) 2l×b sq. units c) l×b sq. units

   d) $(lb)^2$ sq. units

   Ans: c) l×b sq. units

4. Area of a circle with radius (r) is_____.

   a) πr^2 sq. units b) ½ πr^2 sq. units c) $2\pi r^2$ sq. units

   d) $4\pi r^2$ sq. units

   Ans: a) πr^2 sq. units

5. The perimeter of rectangle with length l and width "w" is_____.

   a) $(l + w)$ b) $2(l + w)$ c) $(l - w)$ d) l×w

   Ans: b) $2(l + w)$

6. If the length and breadth of a rectangle are 15 cm and 10cm respectively Its area is _____.

a) 100 sq.cm b) 150 sq.cm c) 115 sq.cm d) 200sq.cm

Ans: b) 150 sq.cm

7. The area of a rhombus where diagonals are of length 10cm and 8.2cm is _____.

a) 41 cm^2 b) 82 cm^2 c) 410cm^2 d) 820cm^2

Ans: a) 41 cm^2

8. The area of a Trapezium is 480cm^2 the distance between two parallel side is 15cm and one of the parallel side is 20cm the other parallel side is_____.

a) 20 cm b) 34 cm c) 44 cm d) 50 cm

Ans: c) 44 cm

9. The area of a rhombus is 240cm^2 and one of the diagonals is 16cm find the other diagonal _____.

a) 16cm b) 20cm c) 30cm d) 36cm

Ans: c) 30cm

10. The area of a rhombus is 60cm^2 one diagonal is 10cm the other diagonal is_____.

a) 6cm b) 12 cm c)3cm d)24cm

Ans: b) 12 cm

11. The area of a trapezium is $40cm^2$ If parallel sides are 12cm and 8cm.The distance between the parallel side is _____.

a) 1 cm b)2cm c)3cm d)4cm

Ans: d)4cm

12. If the length and breadth of a rectangle are10cm and 5cm respectively its area is _____.

a) 100 sq.cm b) 50 sq.cm c) 115 sq.cm d)200sq.cm

Ans: b) 50sq.cm

13. The area of a rhombus whose diagonals are of length 10cm and 8.2cm is_____.

a) 41 cm^2 b) $82cm^2$ c)410 c d)$820cm^2$

Ans: a) 41 cm^2

14. The area of a trapezium is $480cm^2$,the distance between two parallel side is 15cm and one of the side is 20cm the other parallel side is____.

a) 20cm b)34cm c)44cm d)50cm

Ans: c)44cm

15. The area of a rhombus is $240cm^2$ and one of the diagonals is 16cm. Find the Other diagonal_____.

a)16cm b)20cm c)30cm d)36cm

Ans: c)30cm

16. In a quadrilateral half of the product of the sum of the length of parallel sides and the parallel distance between them gives the area of

a) rectangle b) parallelogram c) triangle d) trapezium

Ans: d) trapezium

17. Which of the following is an example of two dimensions_____.

a) cuboid b) cone c) sphere d) circle

Ans: d) circle

18.The area of a trapezium is_____.

a) ½(sum of parallel side) x h b)2(sum of parallel side) x h

c) (sum of parallel side) x h d)½(sum of parallel side) + h

Ans: a) ½(sum of parallel side) x h

19. Two dimensional figure is a__.

a) Solid figure b) Plane figure c) Cylinder figure

d) none

Ans: b) Plane figure

20. The length of parallel side of trapezium is 14cm and 6cm its length is 5cm.Then its area will be_____.

a) $50cm^2$ b) $100cm^2$ c) $210cm^2$ d) $10cm^2$

Ans: a) $50cm^2$

21. Area of each of the sectors is equal to _____.

a) $\frac{1}{n}\pi r^3$ sq. units b) $\frac{1}{n}\pi r^2$ sq. units

c) $\frac{1}{n}r^2$ sq. units d) $\frac{1}{n}\pi$ sq. units

Ans: b) $\frac{1}{n}\pi r^2$ sq. units

22. Each part of a circle which is divided by a chord is called as___.

a) Sector b) Segment c) diameter d) Radius

Ans: b) Segment

23. The radius of a sector is 21cm and its central able is 120^0, the perimeter of sector _____(approximately).

a) 85cm b) 86cm c) 87cm d) 88cm

Ans: b) 86cm

24. Area of the semi-circle is _____

a) $\frac{1}{2}\pi r^2$ sq. units b) $\frac{1}{2}2\pi r^2$ sq. units

c) $\frac{1}{2}3\pi r^2$ sq. units d) $\frac{1}{2}\pi r$ sq. units

Ans: a) $\frac{1}{2}\pi r^2$ sq. units

25. The perimeter of circular quadrant is _____.

a) $\left(\frac{\pi}{2}-2\right)r$ units b) $\left(\frac{\pi}{2}+2\right)r$ units

c) $\left(\frac{\pi}{2}+2\right)$units d) $\left(\frac{\pi}{3}+2\right)r$ units

Ans: b) $\left(\frac{\pi}{2}+2\right)r$ units

26. A spinner of radius 7.5cm is divided into 6 equal sectors. Find the area of each of the sectors.

a) 9.374π sq.cm b) 9.374sq.cm

c) 9.375π sq.cm d) 9.375sq.cm

Ans: c) 9.375π sq.cm

27. The meeting point of more than two edges in a polyhedron is called as _____.

a) Width b) Segment c) Vertex d) Faces

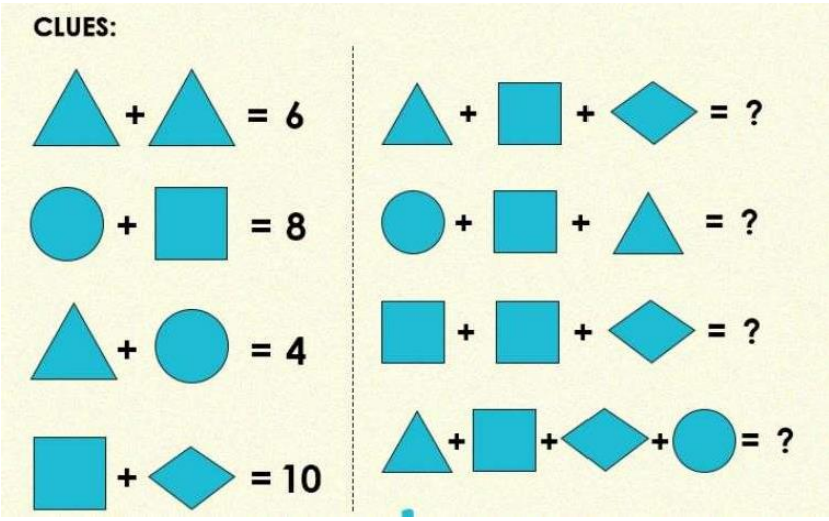
Ans: c) Vertex

28. A circle of radius 70cm is divided into 5 equal sectors. Find the area of the each of sectors.

a) 980 πcm^2 b) 990 πcm^2 c) 980 πm d) 990 πm

Ans: a) 980 πcm^2

Can you solve this puzzle?



WORK SHEET

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)

Set

Roll Number

Subject

Mobile Number

Test ID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D
39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D
56	A	B	C	D
57	A	B	C	D
58	A	B	C	D
59	A	B	C	D
60	A	B	C	D
61	A	B	C	D
62	A	B	C	D
63	A	B	C	D
64	A	B	C	D
65	A	B	C	D
66	A	B	C	D
67	A	B	C	D
68	A	B	C	D
69	A	B	C	D
70	A	B	C	D
71	A	B	C	D
72	A	B	C	D
73	A	B	C	D
74	A	B	C	D
75	A	B	C	D

76	A	B	C	D
77	A	B	C	D
78	A	B	C	D
79	A	B	C	D
80	A	B	C	D
81	A	B	C	D
82	A	B	C	D
83	A	B	C	D
84	A	B	C	D
85	A	B	C	D
86	A	B	C	D
87	A	B	C	D
88	A	B	C	D
89	A	B	C	D
90	A	B	C	D
91	A	B	C	D
92	A	B	C	D
93	A	B	C	D
94	A	B	C	D
95	A	B	C	D
96	A	B	C	D
97	A	B	C	D
98	A	B	C	D
99	A	B	C	D
100	A	B	C	D

Candidate's Signature

Invigilator's Signature

SCIENCE

CONTENT

S.NO	TOPICS	PAGE NO
1.	NUTRIENTS	73 - 86
2.	METALLURGY	87 - 107
3.	FLUIDS	108 - 120
4.	BLOOD	121 - 137

UNIT-1

Nutrients

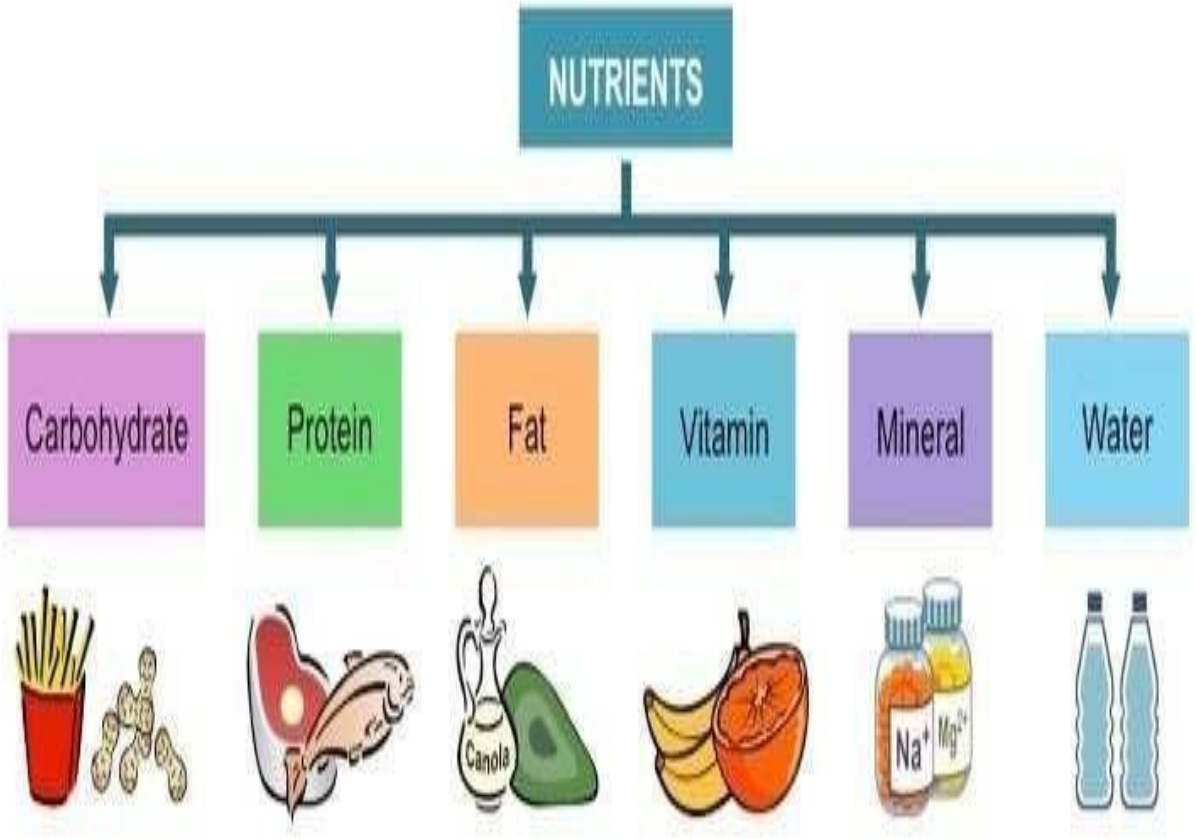
Nutrients:

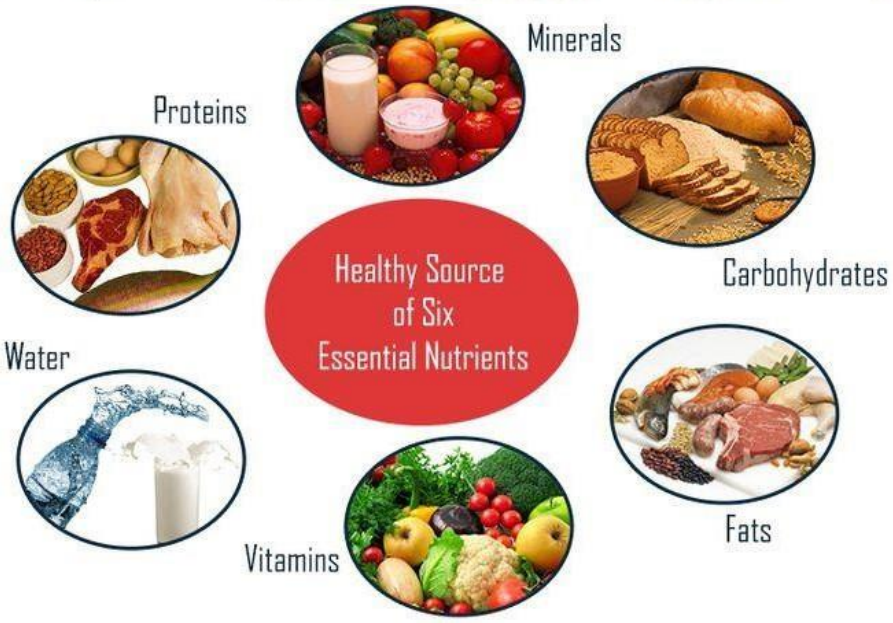
A nutrient is a substance used by an organism to survive, grow, and reproduce. The requirement for dietary nutrient intake applies to animals, plants, fungi, and protists.

- **Carbohydrates**
- **Fats**
- **Protein**
- **Vitamin**
- **Minerals**
- **Water**

Types of Nutrient:

Carbohydrates	-	Provide energy Proteins
Proteins	-	Help in growth
Fats	-	Provide energy
Vitamins	-	Act as regulators in physiological activities.
Water	-	Transport food, regulates body temperature


NUTRIENTS
Carbohydrate
Protein
Fat
Vitamin
Mineral
Water
Canola
Na+
Mg2+


Minerals
Proteins
Carbohydrates
Healthy Source
of Six
Essential Nutrients
Water
Fats
Vitamins

Carbohydrates:

Form of carbohydrates	Sources
Sugar	Fruits, Honey, Cane sugar, Beetroot
Starch	Rice, Maize, Potato, etc.
Dietary fiber	Whole grain, Nuts, etc.

A carbohydrate is composed of carbon, hydrogen and oxygen in the ratio of 1:2:1 $(CH_2O)_n$.

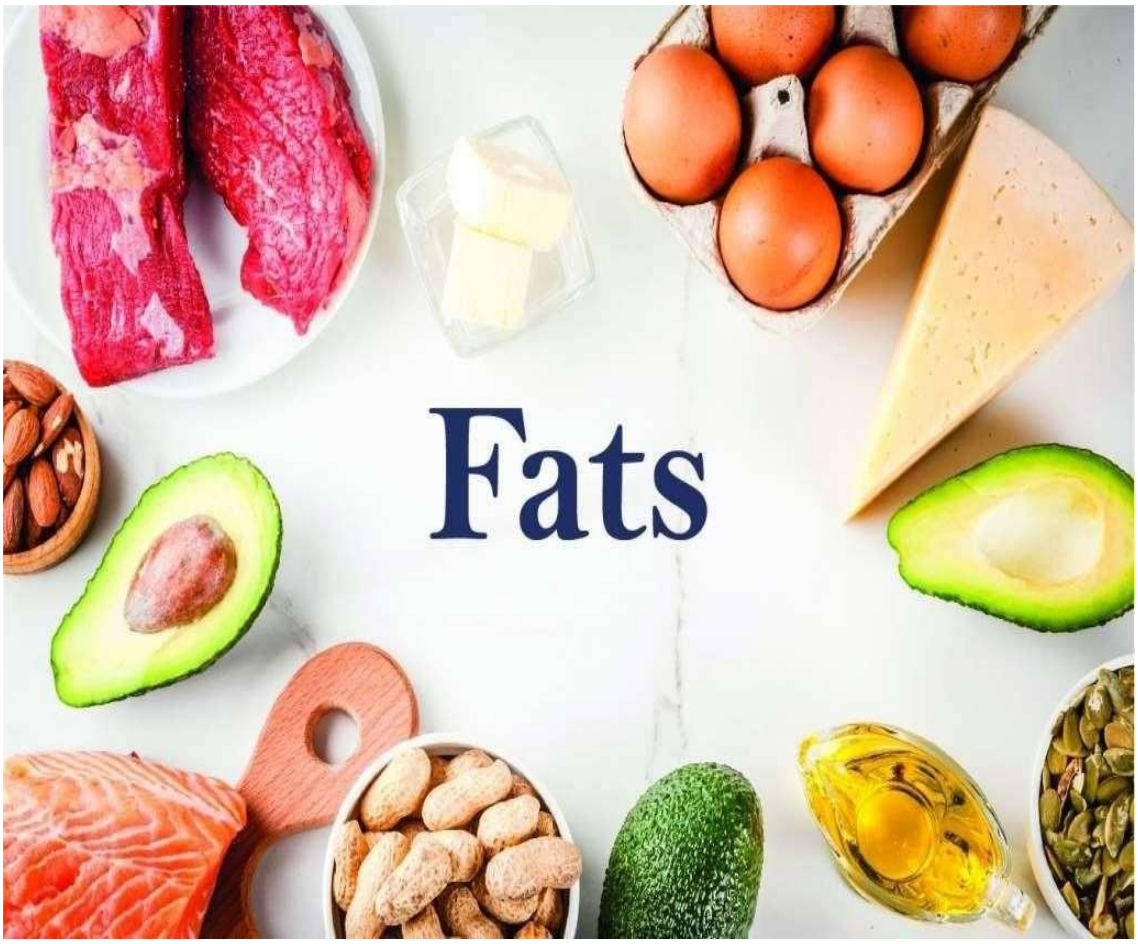
There are three types namely mono saccharides, disaccharides and polysaccharides.

Glycogen, a polysaccharide is found in liver and muscles.

- ✓ **Maltose Glucose + Glucose (In germinating cereals)**
- ✓ **Sucrose Glucose + Fructose (Cane sugar)**
- ✓ **Lactose (Milk) Glucose + Galactose**

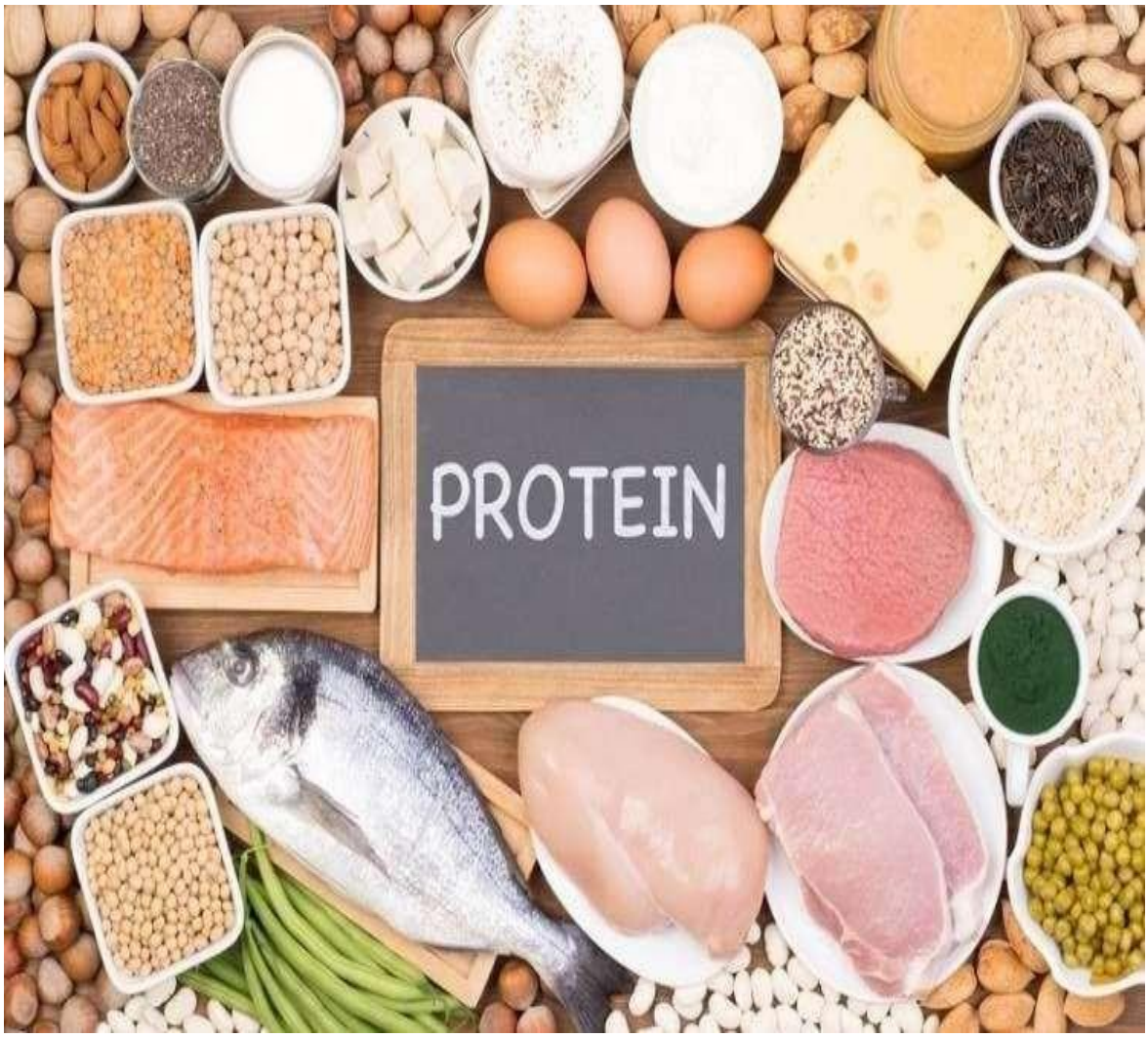
FATS:

Fat is also an energy giving food and it provides more energy the carbohydrates .



Protein:

Proteins are necessary for our growth as well as for regulating various body functions such as digestion. Proteins are body building foods.



Deficiency diseases:

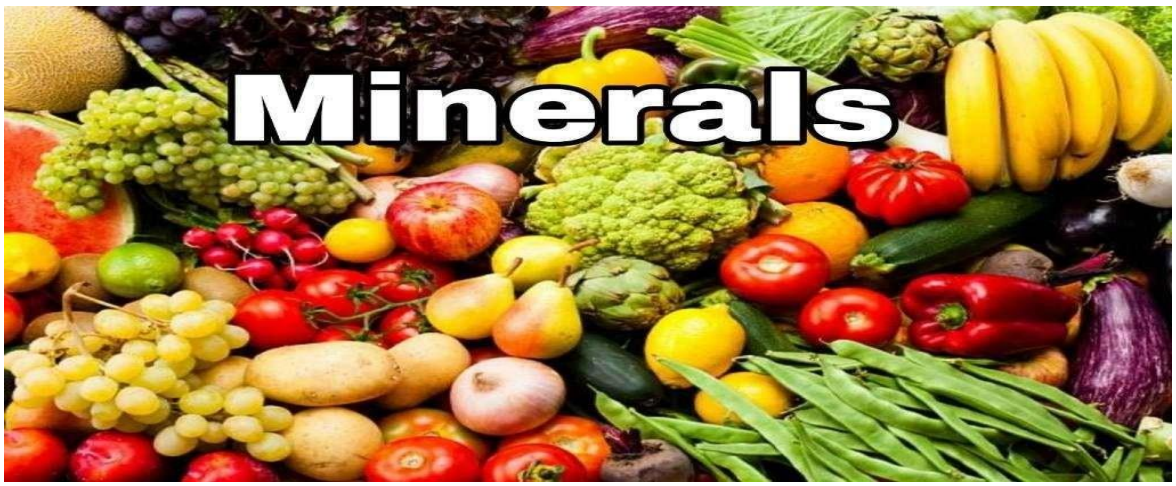
- ✓ Marasmus
- ✓ Kwashiorkor (Children from1-5age)

Vitamin

Vitamin	Function	Disease deficiency	symptoms
Vitamin A	Healthy vision and skin	Night blindness	Poor vision, difficult of sight in dim light.
Vitamin B	Health nervous system formation of RBS	Beriberi	Nerve weakness, fatigue
Vitamin C	Protects gums helps immune system	Scurvy	Bleeding gums
Vitamin D	Calcium absorption and strong bones	Rickets	Weak and flexible bones
Vitamin E	Antioxidant	Nerve weakness, vision deterioration	Sterility, lack of resistance power to illnesses
Vitamin K	Delayed blood clotting	Weakness of the bones, teeth, etc	Profuse bleeding after a small in fury.

Minerals:

Minerals are required for growth as well as for the regulation of normal body function. Minerals are also a protective food.



Minerals	Functions
Calcium	Strong bones and teeth, clotting of blood.
Phosphorus	Strong bones and teeth.
Iodine	Synthesis of thyroid hormone.
Iron	Formation of hemoglobin and brain development.

Water:

Our body needs an adequate supply of water in order to maintain good health.

Any human being show takes minimum eight tumblers (2Litres) of water every day.

CHOOSE THE BEST ANSWER:

1. A carbohydrate is composed of carbon, hydrogen and oxygen in the ratio of _____

a) 1:1:1 b) 2:1:2 c) 1:2:1 d) 2:1:1

2. Carbohydrates are of _____types.

a) Two b) Three c) Four d) Five

3. Rice, Maize, Potato, Cane Sugar, and Beetroot contain nutrient.

a) Protein b) Fat c) carbohydrates d) Water

4. _____Act as regulators in physiological activities.

a) Water b) Fats c) Minerals d) Vitamins

5. _____ Helps to transport food, regulates body temperature.

a) Minerals b) Water c) Vitamins d) Fats

6. _____Consist of starch.

a) Rice b) Maize c) Potato d) All of them

7._____Consists of sugar.

a) Fruits b) Honey c) Beetroot d) All of them

8. _____ Is found in liver and muscles.

a) Maltose b) Glycogen c) Glucose d) Sucrose

9. _____ Are body building foods.

a) Fats b) Vitamins c) Protein d) Minerals

10. Protein deficiency disease_____

a) Scurvy b) Rickets c) Beriberi d) Marasmus

11. Which of the following vitamin helps in blood clotting?

a) Vitamin A b) Vitamin C c) Vitamin D d) Vitamin K

12. Which of the following vitamin helps in strong bones?

a) Vitamin A b) Vitamin C c) Vitamin D d) Vitamin K

13. Which of the following vitamin deficiency causes beriberi?

a) Vitamin A b) Vitamin B c) Vitamin D d) Vitamin E

14. Which is the leading cause of blindness?

a) Glaucoma b) Cataracts

c) Color blindness d) Vitamin A deficiency

15. Which of the following vitamin deficiency causes rickets?

a) Vitamin B b) Vitamin K c) Vitamin D d) Vitamin E

16. Symptoms of bleeding gums_____deficiency.

a) Vitamin A b) Vitamin B c) Vitamin C d) Vitamin D

17. Which of the following vitamin deficiency causes nerve weakness?

a) Vitamin B b) Vitamin C c) Vitamin D d) Vitamin E

18. Function of strong bones and teeth clothing of blood_____mineral.

a) Calcium b) Phosphorus c) Iodine d) Iron

19. Which of the following mineral functions synthesis of thyroid hormone?

a) Calcium b) Phosphorus c) Iodine d) Iron

20. Helps to formation of hemoglobin and brain development.

a) Phosphorus b) Iodine c) Iron d) Calcium

21. Any human being should take minimum_____liters of water every day.

a) 2 b)3 c)4 d)5

22. _____Provides more energy than carbohydrates.

a) Protein b) Fats c) Both A&B d) None

23. Glucose + galactose gives_____.

a) Maltose b) Sucrose c) Lactose d) None

24. Glucose +glucose gives_____

a) Maltose b) Sucrose c) Lactose d) None

25. Glucose +fructose gives_____.

a) Maltose b) Sucrose c) Lactose d) None

26. A ____is composed of carbon hydrogen and oxygen

a) Fat b) mineral c) carbohydrate d) vitamins

27._____Is a polysaccharide is found in liver and muscles

a) Glycogen b) glucose c) maltose d) lactose

28._____Is also an energy giving food and it provides more energy than carbohydrates

a) Fat b) mineral c) carbohydrates d) vitamins

29. Carbohydrates are of three types namely mono saccharides, disaccharides and _____

a) Polysaccharides b) phosphorous

c) both a and b d) none of the above

30. _____ are also a protective food

a) Iodine b) iron c) minerals d) calcium

31. Our body needs adequate amount of____in order to maintain a good health

a) Fat b) oil c) water d) none of these

32. Iron helps in the formation of _____and brain development

a) Hemoglobin b) iodine c) calcium d) phosphorous

33. Vitamin A deficiency leads to the cause of ___

a) Glaucoma b) blindness c) cataracts d) marasmus

WORK SPACE

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)

Set

Roll Number

Subject

Mobile Number

Test ID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D
39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D
56	A	B	C	D
57	A	B	C	D
58	A	B	C	D
59	A	B	C	D
60	A	B	C	D
61	A	B	C	D
62	A	B	C	D
63	A	B	C	D
64	A	B	C	D
65	A	B	C	D
66	A	B	C	D
67	A	B	C	D
68	A	B	C	D
69	A	B	C	D
70	A	B	C	D
71	A	B	C	D
72	A	B	C	D
73	A	B	C	D
74	A	B	C	D
75	A	B	C	D

76	A	B	C	D
77	A	B	C	D
78	A	B	C	D
79	A	B	C	D
80	A	B	C	D
81	A	B	C	D
82	A	B	C	D
83	A	B	C	D
84	A	B	C	D
85	A	B	C	D
86	A	B	C	D
87	A	B	C	D
88	A	B	C	D
89	A	B	C	D
90	A	B	C	D
91	A	B	C	D
92	A	B	C	D
93	A	B	C	D
94	A	B	C	D
95	A	B	C	D
96	A	B	C	D
97	A	B	C	D
98	A	B	C	D
99	A	B	C	D
100	A	B	C	D

Candidate's Signature

Invigilator's Signature

UNIT-2

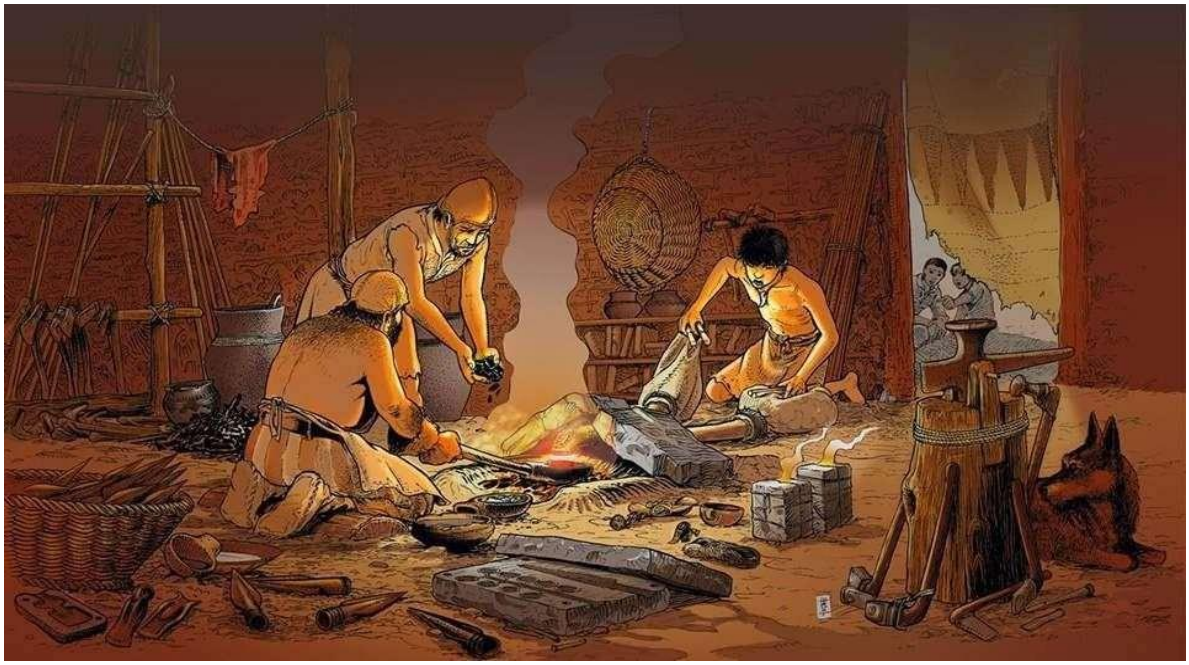
METALLURGY

Introduction:

Metallurgy art and science of extracting metals from their ores and modifying the metals for use metallurgy customarily refers to commercial as opposed to laboratory methods**.**

History of metallurgy:

The present day use of metals is the culmination of a long path of development extending over approximately 6, 500 years. It is generally agreed that the first known metals were gold, silver, and copper, which occurred in the native or metallic state.



Mineral and ore:

A naturally Occurring substance obtained by mining which contain the metal in Free State or in the form of compounds like oxide sulphides etc... is called a mineral.

Mineral that contains a high percentage and economically

are called ores.

Eg: Bauxite and china clay (Al_2O_3. SiO_2. $2H_2O$) Both are mineral of aluminium however aluminium can be commercially extracted from bauxite while extraction from china clay is not a profitable ore.

Metal	Ore	Composition
Aluminium	Bauxite Diaspore Kaolinite	$Al_2O_3.nH_2O$ $Al_2O_3.H_2O$ $Al_2O_3.\ Si_2O_5.\ (H_2O)_4$
Iron	Haematite Magnetite Siderite Ironpyrite Limonite	Fe_2O_3 Fe_3O_4 $FeCO_3$ FeS_2 $Fe_2O_3.3H_2O$
Copper	Copper pyrite Copperglance Cuprite Malachite Azurite	$CuFeS_2C$ $u_2S\ Cu_2O$ $CuCO_3.Cu(OH)_2$ $2CuCO_{3.}Cu(OH)_2$

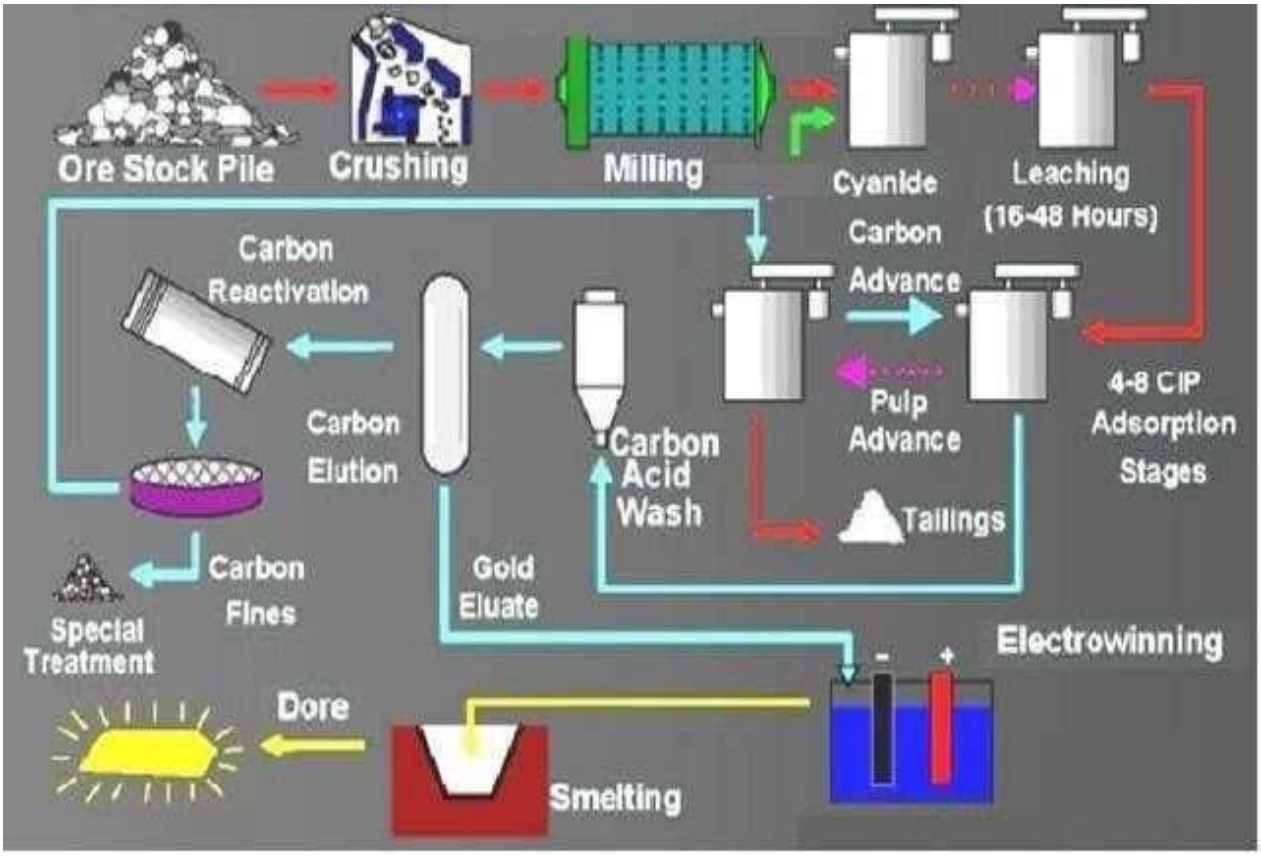
Leaching:

This method is based on the solubility of the ore in a suitable solvent and the reactions in aqueous solution. In this method the crushed ore is allowed of dissolve in a suitable solvent.

Cyanide Leaching:

The crushed ore of gold is leached with aerated dilute solution of sodium cyanide. Gold is converted into a solution cyanide complex

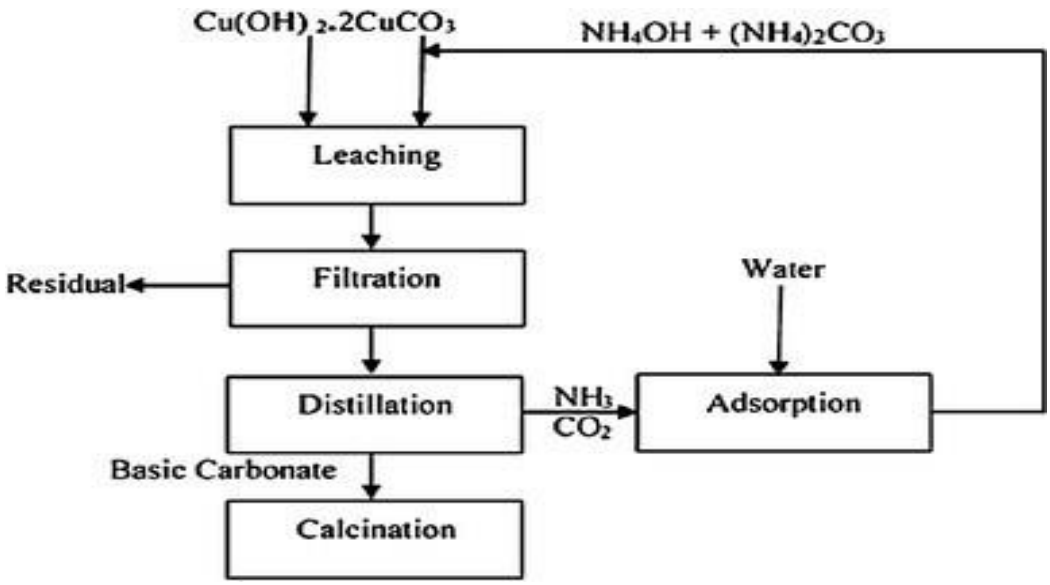
$$4Au_{(s)}+8CN_{(aq)}+O_{2(g)}+2H_2O_{(l)} \longrightarrow 4[Au(CN)_2]_{(aq)} + 4OH^-_{(aq)}$$



Ammonia Leaching:

When a crushed ore containing Nickel, Copper and cobalt is treated with aqueous ammonia under suitable pressure ammonia selectively leaches these metals by forming their soluble complexes.

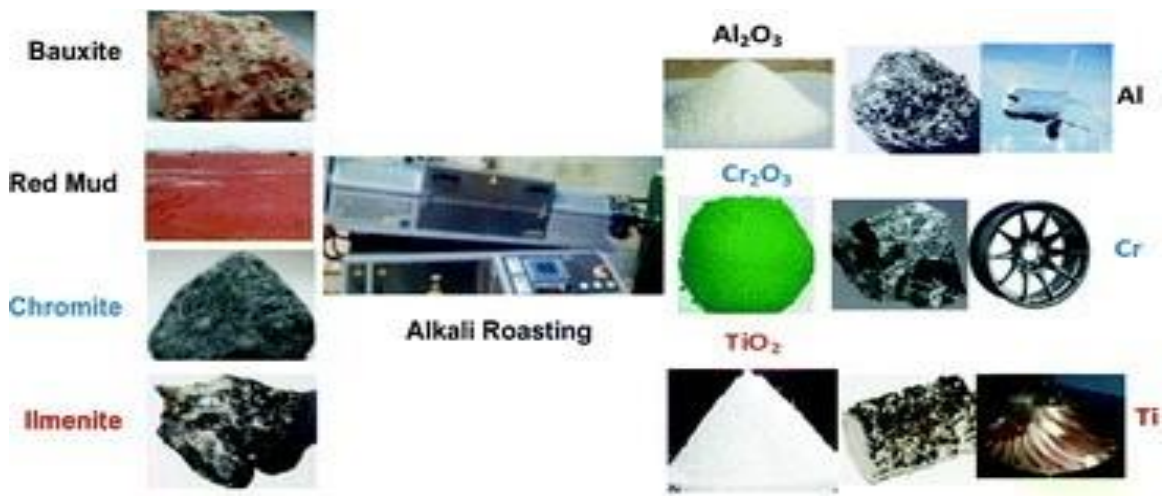
$$[Ni\ (NH_3)_6],\ [Cu\ (NH_3)_2]^{2+}$$



Alkali Leaching:

In this method the ore is treated with aqueous alkali to form a soluble complex.

For example bauxite an important ore of aluminium is heated with a solution of sodium hydroxide in the temperature range 470-520k to form solute sodium metal aluminate behind the impurity.



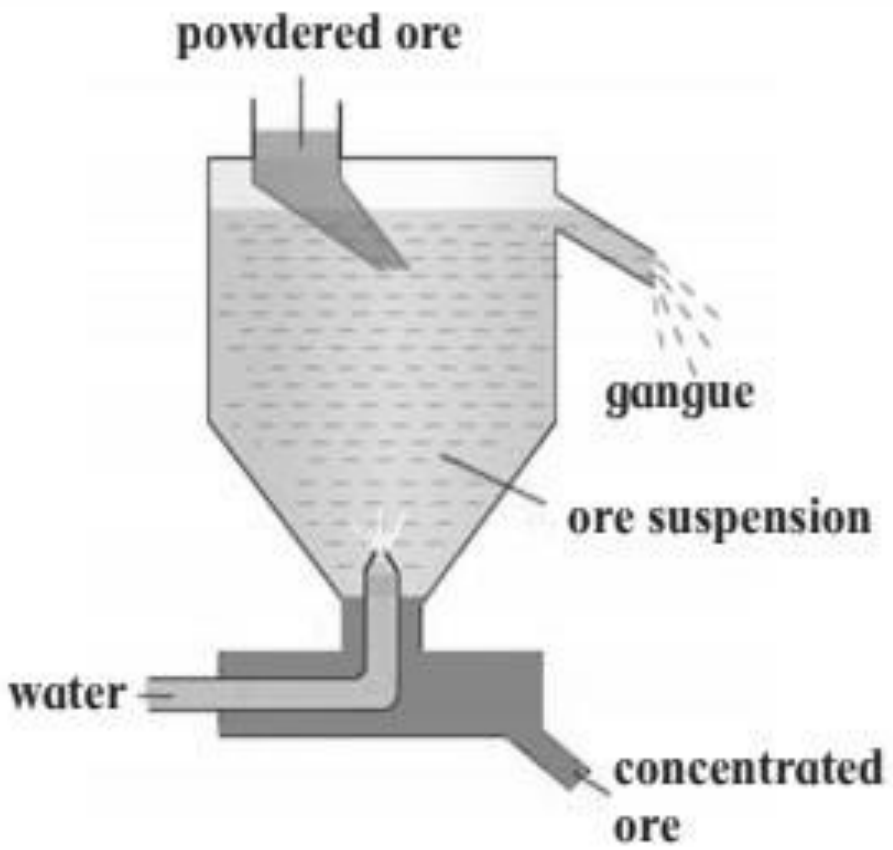
Concentrating of ores:

Generally the ores are associated with non metallic impurities rocky materials and siliceous matter which are collectively known as gangue.

The preliminary step in metallurgical process is removed of these impurities. This removal process is known as concentration of ores Some common methods of ore concentration are discuss below.

i) Gravity separation or hydraulic wash:

In this method the ore having high specific gravity by simply washing with running water. This method the native ore such as gold and oxide ores such as hematite (Fe_2O_3) stone (SnO_2) etc applied

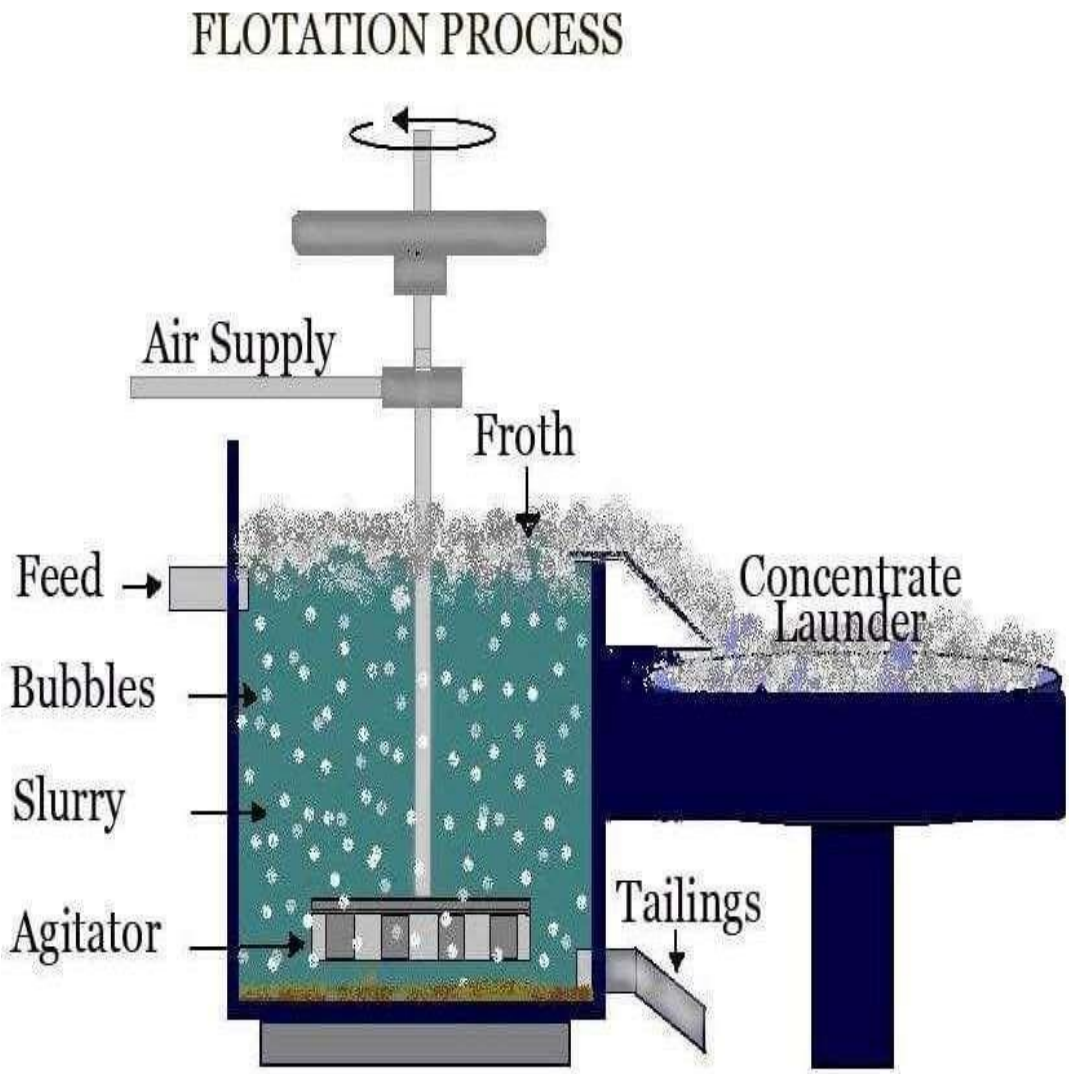


Hydraulic separation

ii) Froth flotation:

This method is commonly used to concentrate sulphide ores such as galena (Pbs), zinc blende (ZnS) In this method, the metallic ore

Particles which are preferentially wetted by oil can be separated from gangue



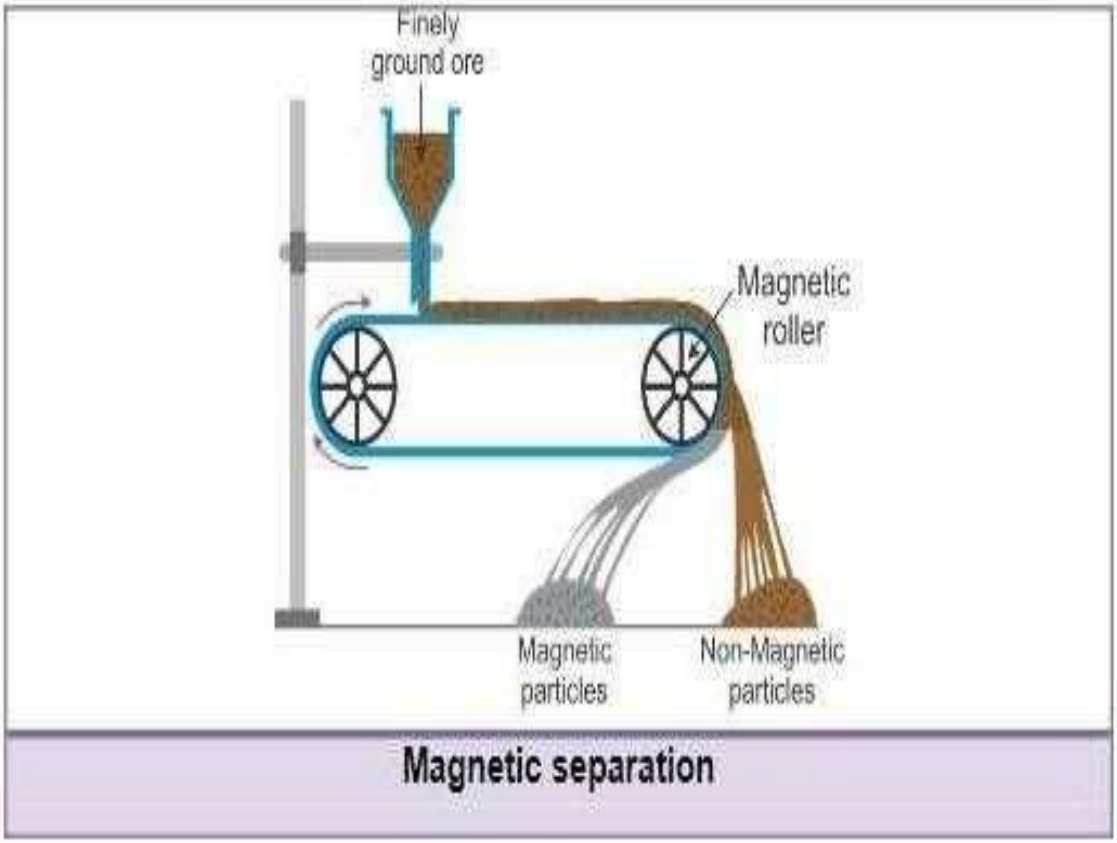
iii) Acid leaching:

Leaching of sulphide ores such as ZnS, Pbs etc. Can be done by treating them with hot aqueous sulphuric acid.

$2ZnS(s) + 2H_2SO_{4\,(aq)} + O_{2\,(g)} \rightarrow 2ZnSO_{4\,(aq)} + 2S(s)\ H2O$

Magnetic Separation:

This method is applicable to ferromagnetic ores and it is based on the difference in the magnetic properties of the ore and the impurities.



For example:

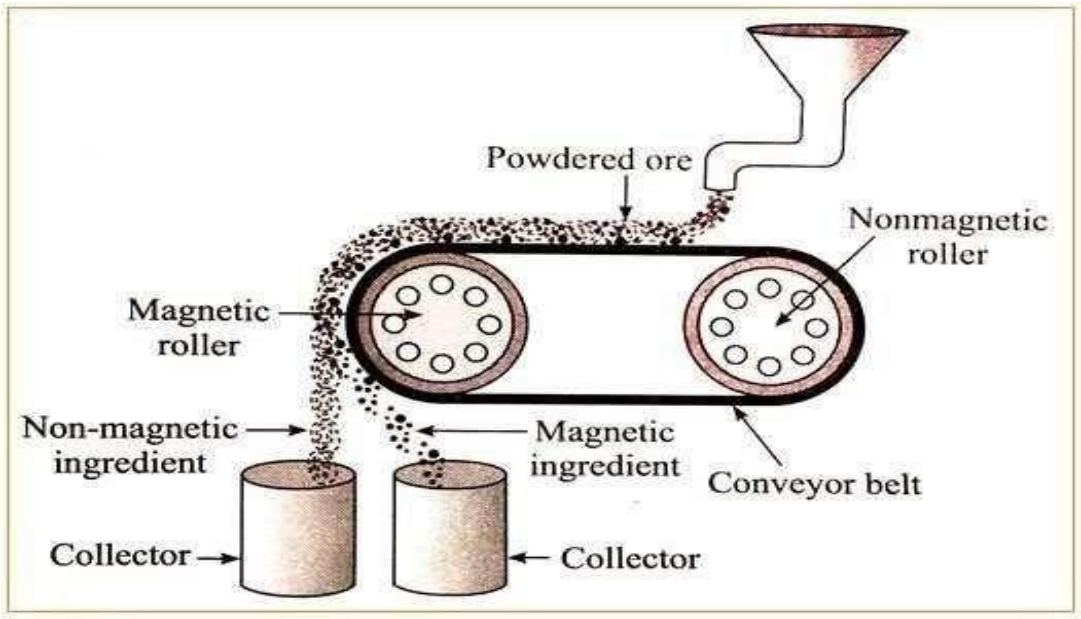
Tin stone can be separated from the wolframite impurity.

Extraction of crude metals:

Extraction of crude metals from the concentrated is carried out in two steps.

(i) Conversion of the ore into oxides of the metal.

(ii) Conversion of meal oxide into metal.

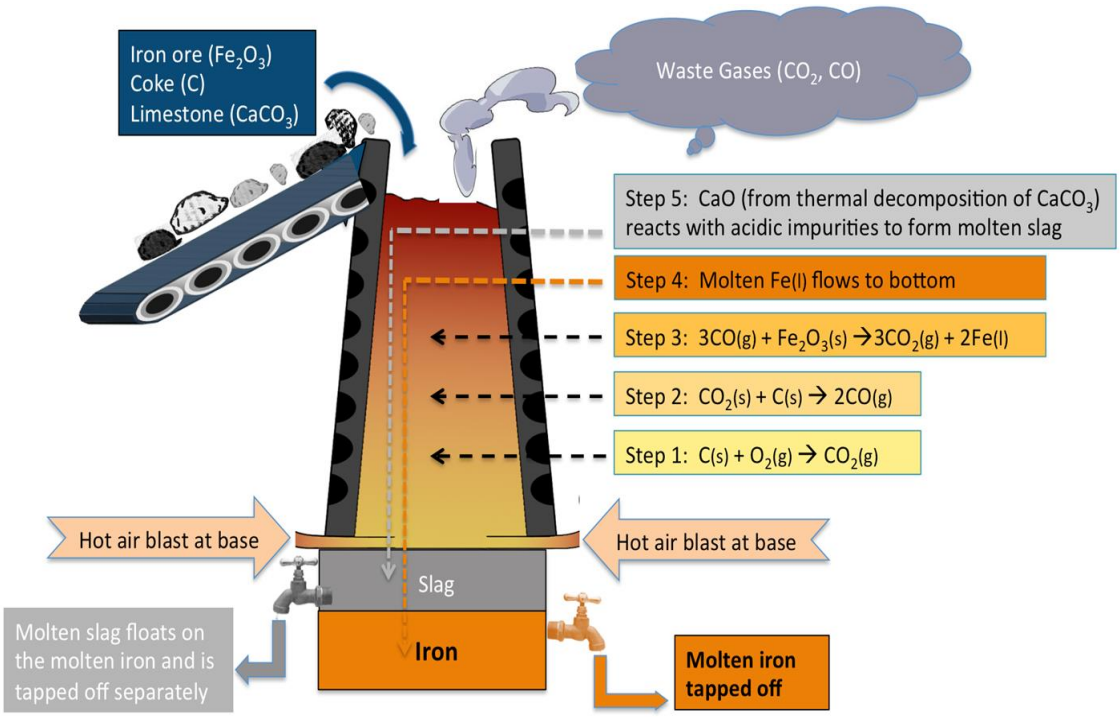


(i) Conversion of the ore in to oxides of the metal:

Roasting:

The method, usually applier for the conversion of sulphide ores in to their oxides.

In this method, the concentrated ore is oxidized by heating it with excess of oxygen in a suitable furnace.



$2PbS+3O_2 \longrightarrow 2PbO+2SO_2$

$4As+3O_2$

Calcination:

Calcination is the process in which the concentrated ore is strongly heated in the absence of air.

`

$$\mathbf{PbCO_3 \rightarrow PbO+CO_2}$$

$$\mathbf{CaCO_3 \rightarrow Cao+CO_2}$$

Smelting:

In this method, a flux Ca chemical substance that from a easily fusible slag with gangue on reducing agent such as carbon,co_2 (or) aluminum added to this concentrated ore and the mixture is metal by heating at an elevated temperature.

$$\mathbf{Fe_2O_3(s) + 3CO\ (g) \rightarrow 2Fe(s) + 3CO_{2\ (g)}}$$

$$\mathbf{CaO(s) + SiO_2(s) \rightarrow CaSiO_3(s)}$$

(Flux) (gangue) (Slag)

$$\mathbf{FeO(s) + SiO_2(s)\ FeSiO_3}$$

(Flux) (gangue) (Slag)

Purification-Refining process:

Generally the mental extracted from its ore contains some impurities such as unreacted oxide ore other metals non metals etc., Removal of such impurities associated with the isolated crude metal is called refinery process.

(i) Distillation:

This method is employed for low boiling volatile metals like zinc and mercury. In this method the impure metal is heated to evaporate and the vapour are condenser to get pure metal.

(ii) Liquation:

In this process the crude metal is heated to form fusible liquid and allowed to flow on sloprey surface. The impure metal is placed on soluble heated pure metal flour down**.**

Electroyoltic refining:

The crude metal is refined by electrolysis

Cathode: pure metal.

Anode: impure metal.

Electrolyte: Acidifier aqueous solution of metal sol.

Uses of metal

(i) Aluminum:

∗**Aluminium is a good electrical conductor and cheep**

∗**Aluminium show high resistance to corrosion. It is used medical equipments refrigeration gas pipe ling.**

(i)Copper:

(i) Copper is the first metal used by the human and extender used of its alloy bronze new era Bronze age.

(ii) Copper and its alloys are user for making wires water pipes and other electrical parts.

(iii) Gold:

(i) Gold, one of the expensive and precious metal. It's used for coinage.

(ii) It is used extensively in jewellary in its alloy from with copper, cheap jewellary, dental filling.

CHOOSE THE BEST ANSWER:

1. Which one of the following is the first known metal of human_____.

   a) Aluminum b) Zinc c) Copper d) Gold

2. Minerals that contain a high percentage of metal from which it can be extracted conveniently and economically are called_____.

   a) Gangue b) Slag c) Ores d) Flux

3. Which one of the following is ore of aluminum _____.

   a) Bauxite b) Diaspore c) Kaolinite d) All these above

4. Which one is the composition of Hematite?

   a) Fe_2O_3 b) Fe_3O_4 c) $FeCO_3$ d) FeS_2

5. Which one is the ore of copper.

   a) Bauxite b) Copper Pyrite

   c) Hematite d) Siderite

6. Which one of the following ores is best concentrated by Gravity Separation method.

   a) Hematite b) Tinstone c) Glena d) (a) and (b)

7. Which one of the following ore is best concentrated by froth floatation method?

   a) Galena b) Hematite c) Cassiterite d) all these above

8. Wolframiting ore is separated from tin stone by the process of___.

   a) Smelting b) Calcination

   c) Roasting d) Electromagnetic Separation

9. Which of the following is used for concentrating ore in metallurgy_____.

a) Leaching b) Roasting c) Froth Flotation d) A&C

10. The crushed ore of gold is leached by___.

a) Cyanide b) Ammonia c) Alkali d) Acid

11. The crushed ore containing nickel, copper and cobalt is treated with_____.

a) Cyanide b) Aqueous ammonia

c) Alkali d) Acid

12. The sulphide ore is leached by_____.

a) Ammonia b) Sodium Hydroxide

c) Sulphuric Acid d) Cyanide

13. Which one of the method applied for the conversion of sulphide ores in to their oxides_____.

a) Roasting b) Calcination c) Smelting d) None of the above

14. Which one of the following process in which the concentrated ore is strongly heated in the absence of air____.

a) Roasting b) Calcination c) Smelting d) Leaching

15. A chemical substance that forms a easily fusible slag with gangue___.

a) Matte b) Flux c) Slag d) Gangue

16. Flux + gangue→?

a) Flux b) Gangue c) Matte d) Slag

17. The rocky materials and siliceous matter which are collectively known as

a) Flux b) Gangue c) Matte d) Slag

18. The removal of impurities associated with the isolated crude mental is called?

a) Concentration of ores b) Smelting

c) Refining process d) all these above

19. Which one of the following method is employed for low boiling volatile metals?

a) Distillation b) Liquation c) Refining process d) None of these

20. In the electrolytic refining of copper, which one of the following is used as anode?

a) Pure copper b) Impure copper c) Carbon rod d) platinum electrode

21. Which one of the following metal is used to good electrode conductor_____.

a) Zinc b) Aluminum c) Gold d) Copper

22. Which one is used to medical equipments_____.

a) Aluminium b) Gold c) Zinc d) Copper

23. Which one of the metal is used to make alloy bronze_____.

a) Gold b) Iron c) Copper d) Aluminum

24. Which one of the metal is used to water pipes_____.

a) Copper b) Gold c) Silver d) Iron

25. Which one of the metal is used to dental filling _____.

a) Aluminum b) Copper c) Gold d) Silver

26. Which one is the composition of iron pyrite?

a) Fe_3O_4 b) Fe_2O_3 c) FeS_2 d) none of these

27. Is the crushed ore is allowed of dissolve in a suitable solvent.

a) leaching b) calcinations c) smelting d) roasting

28. _____ is converted into a solution cyanide complex?

a) Gold b) silver c) aluminum d) none of these

29. Leaching is treated with aqueous alkali to form a soluble complex?

a) ammonia b) cyanide c) alkali d) none of these

30. Which one is the composition of magnetite?

a) $FeCO_3$ b) CO c) Fe_3O_4 d) none of these

31. The preliminary step in _____ process is removed of these impurities?

a) Metallurgical b) Water c) alkali d) none of these

32. _____ Method is commonly used to concentrate sulphide ores such as galena and zinc blende?

a) Hydraulic wash b) distillation

c) froath flotation d) both a and c

33. Roasting is oxidized by heating it with excess of _____ in a suitable furnace?

a) Nitrogen b) oxygen c) carbon dioxide d) helium

34. Which one is the composition of copper pyrites?

a) Cu_2O b) $CuFeS_2$ c) FeS_2 d) none of these

35. Calcination is the process in which the concentrated ore is strongly heated in the absence of _____.

a) Water b) Air c) Sunlight d) Zinc

36. Distillation method is employed for _____volatile metals like zinc and mercury.

a) Low boiling b) high boiling c) slow boiling d) refining

37. In _____process the crude metal is heated to from fusible liquid and allowed to fall on the sloppy surface?

a) Liquation b) refining c) distillation d) alumination

38. _____is the first metal used by human?

a) Zinc b) Copper c) aluminum d) Gold

39. _____ is one of the expensive and precious metals?

a) Aluminum b) gold c) copper d) zinc

40. _____ Show high resistance to corrosion?

a) Cathode b) aluminum c) gold d) copper

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)

Set

Roll Number

Subject

Mobile Number

Test ID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D
39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D
56	A	B	C	D
57	A	B	C	D
58	A	B	C	D
59	A	B	C	D
60	A	B	C	D
61	A	B	C	D
62	A	B	C	D
63	A	B	C	D
64	A	B	C	D
65	A	B	C	D
66	A	B	C	D
67	A	B	C	D
68	A	B	C	D
69	A	B	C	D
70	A	B	C	D
71	A	B	C	D
72	A	B	C	D
73	A	B	C	D
74	A	B	C	D
75	A	B	C	D

76	A	B	C	D
77	A	B	C	D
78	A	B	C	D
79	A	B	C	D
80	A	B	C	D
81	A	B	C	D
82	A	B	C	D
83	A	B	C	D
84	A	B	C	D
85	A	B	C	D
86	A	B	C	D
87	A	B	C	D
88	A	B	C	D
89	A	B	C	D
90	A	B	C	D
91	A	B	C	D
92	A	B	C	D
93	A	B	C	D
94	A	B	C	D
95	A	B	C	D
96	A	B	C	D
97	A	B	C	D
98	A	B	C	D
99	A	B	C	D
100	A	B	C	D

Candidate's Signature

Invigilator's Signature

UNIT-3

FLUIDS

Introduction:

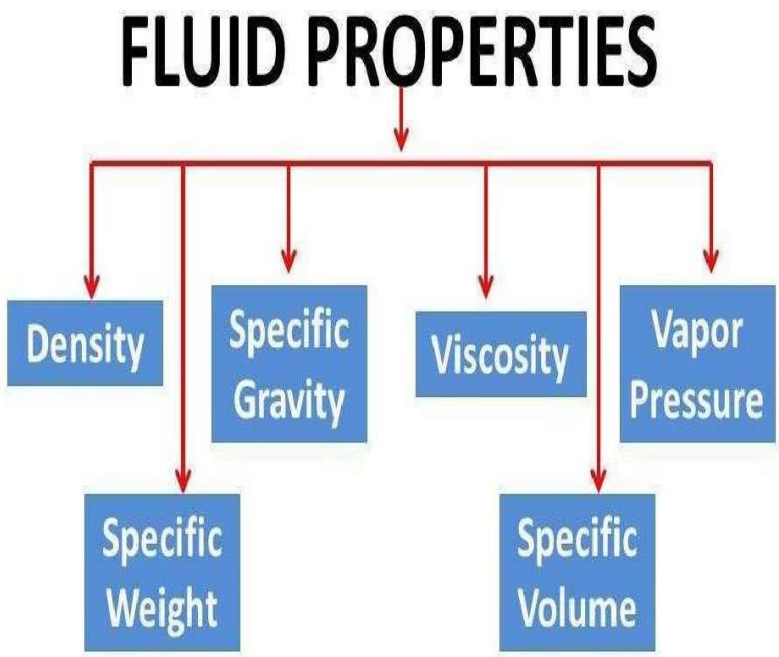
Fluids are found everywhere in the word. Earth has $\left(\frac{2}{3}\right)$ water And $\left(\frac{1}{3}\right)$ of land.

The force acting an per unit area is called pressure. This force is always normal to the surface of the object.

The pressure is scalar quantity. The S.I unit of pressure and the dimensional formula in pressure$[ML^{-1}\,T^{-2}]$. The another S.I Unit of pressure pascal.

It's defined as the pressure exerted by the atmosphere at sea level

$$\mathbf{1atm=1.013\times10^{5}}$$

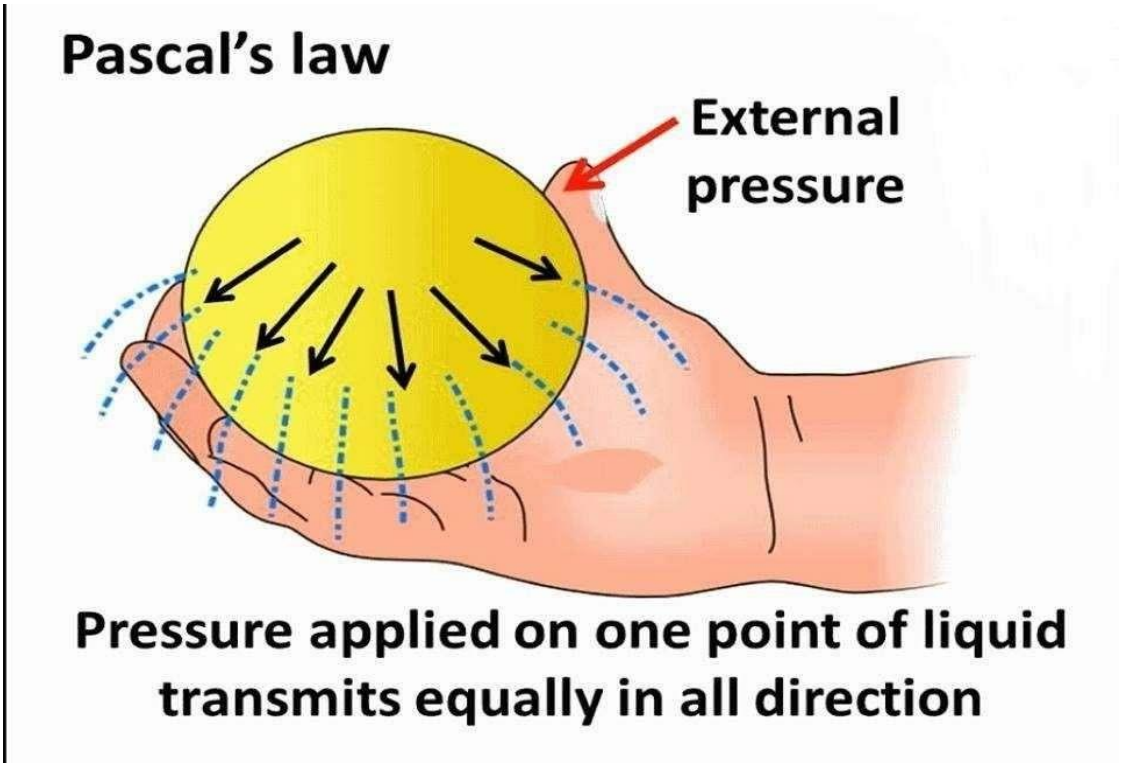


The two are more parameter such as density and relative density which are used describe the nature of fluids.

Density of fluids:

The density of fluids is defined as mass per unit volume.

The density $\boldsymbol{\rho} = \frac{\mathbf{m}}{\mathbf{v}}$



The dimension formula $[ML^{-3}]$ and the SI units kg/m^3. And more important the density of fluids is positive scalar quantity.

<u>Relative density (or) specific gravity:</u>

At 4^0c the dimensionless +ve scalar quantity. For example the density of mercury is 136×kgm^{-3} its relative density is equal to.

<u>Pascals law:</u>

If the pressure in a liquid is charged at a particular point, the change is transmitted to the entire liquid without being diminished in magnitude.

The hydraulic lift working as the principle is pascal's law.

Which is one of the more elastic?

The steel and rubber are any one more elastic. If equal stress applied to the both steel and rubber. The steel produce less strain. So the young's modulus object which has younger modulus is more elastic.

Angle of contact:

The angle b/w the tangent to the liquid surface at the point of contact and the solid surface in side. This is known as the angle of contact between solid and liquid. The angle of contact denoted by "θ".

"theta" which is Greek alphabet small letter.

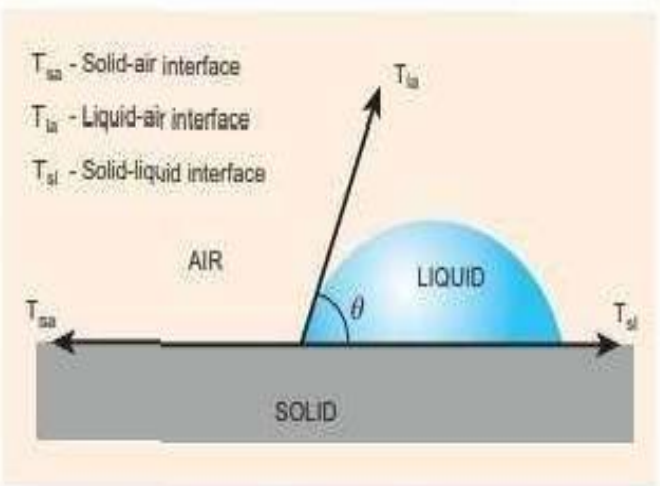


Figure 7.26 Angle of contact of a liquid

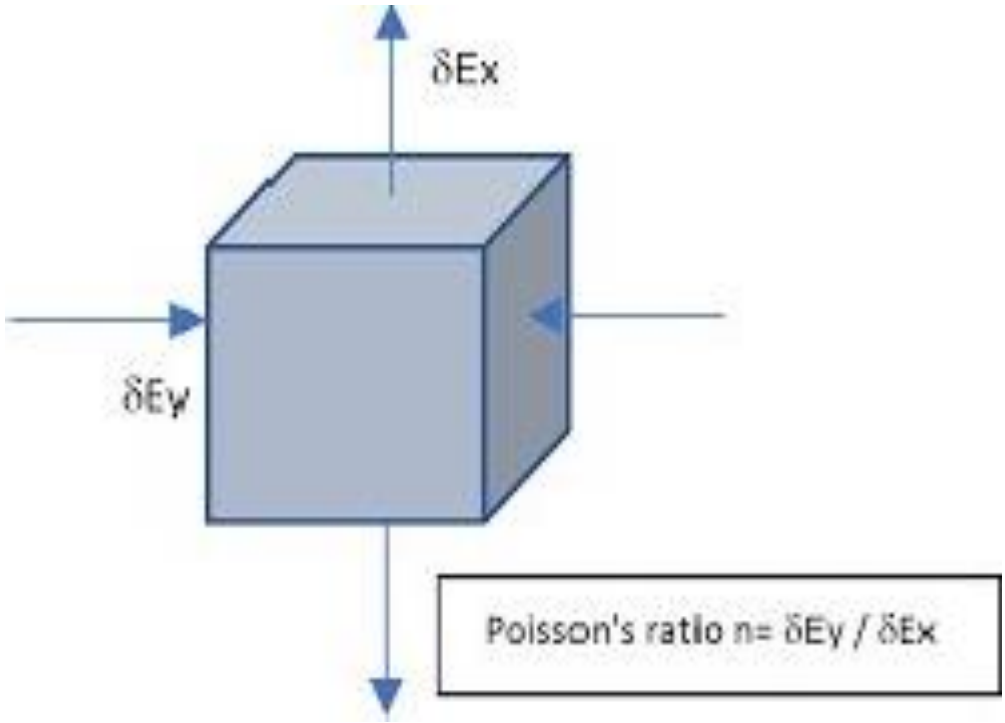
(i) The angle of contact θ less then 90° is acute angle, $\cos\theta$ is $+$ve.

(ii) The angle of contact θ less then 180° as obtuse angle, $\cos\theta$ is $-$ve.

(iii) The angle of contact no equilibrium and liquid will spread over the solid.

Poisson Ratio:

The ratio between the lateral strain and longitudinal strain.



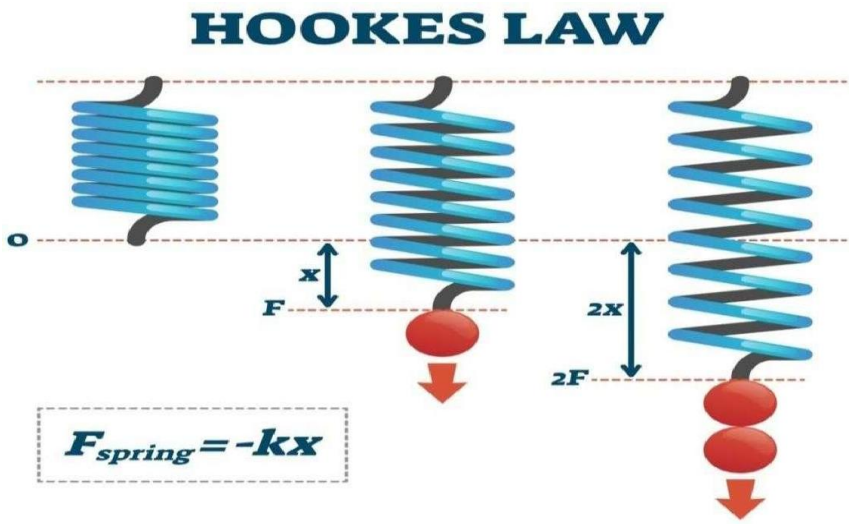
$$\text{Poisson ratio} = \frac{\text{lateral strain}}{\text{longitudinal strain}}$$

Hooke's law:

- ✓ With in elastic limit the stress directly proportional to strain.
- ✓ The stress denoted "σ"
- ✓ The strain denoted Σ

Therefore,

$$\boxed{\sigma a \Sigma}$$



The stress=force/area

σ = F/A

The strain = $\frac{\text{The change size}}{\text{Original size}}$

$=\frac{\Delta L}{L}$

State of matter:

- ✓ There are five nature state of matter.
- ✓ Solids
- ✓ Liquids
- ✓ Gases
- ✓ Plasma
- ✓ Bose-Einstein condensates

Define work:

Force (F), acting on a body move it a displacement in some direction(S).

W = F.S

Unit of work = Joule

W = F.S

= Force. Displacement

Force is vector quantity

Some important value of angle of contact:

- ✓ Sliver and glass =90°
- ✓ Pure water and glass =0°
- ✓ Alcohol and clean glass =0°
- ✓ Ordinary water and glass =8°

Surface Tension:

Water droplet comes to spherical shape due to surface tension.

Volume of sphere (spherical) $=\frac{4}{3}\pi r^2$

A drinking straw works on the existence of pressure.

Inter atomic force:

The force between in two atoms an elements is called inter atomic force.

Some important measuring instrument:

Milk density - Lactometer Current

Value - Ammeter Atmospheric

Pressure – Barometer

Stress:

The force acting per unit area called stress (σ)

$$\sigma = F/A$$

Unit = N/m^2

Strain:

The ratio between changing in length and original length.

$$\Sigma - \Delta\, l/l$$

Unit = no unit

CHOOSE THE CORRECT ANSWER:

1. The density liquid _____.

   a) $\frac{m}{v}$ b) m×v c) m×a d) None of the above

2. Volume of sphere.

   a) $2\pi r^2$ b) $4/3\pi r^2$ c) $1/3\ \pi r^2$ d) $1/3\ \pi r^3$

3. Force acting per unit area called _____.

   a) Gravity b) Acceleration c) mass d) Pressure

4. Which is scalar quantity?

   a) Force b) Velocity c) Pressure d) Acceleration

5. The unit of pressure _____.

   a) Nm^2 b) Nm c) Nm^{-2} d) Nm^{-1}

6. The another unit of pressure_____.

   a) Henry b) Curie c) Pascal d) Time

7. 1atm is equal to_____.

   a) 3.012×10^5pa b) 1.013×10^5pa

   c) 1.013×10^6pa d) 1.310×10^5pa

8. The fourth state of mater?

a) Liquid b) Gas c) Solid d) Plasma

9. The unit of stress_____.

a) N/m b) Nm^2 c) N/m^2 d) $Pascal^{-1}$

10. The unit of strain _____.

a) N/m^2 b) N/m c) Meter d) No unit

11. The ratio b/w lateral strain and longitudinal strain called_____.

a) Poisson's ratio b) Stefan's constant

c) Elasticity d) Elastic energy

12. The Poisson ratio of copper material_____.

a) 0.22 b)0.11 c)0.33 d)0.44

13.The Poisson's ratio of rubber material___.

a) 0.399 b) 0.499 c) 0.599 d) 0.699

14.The work done is__.

a) F/S b) ma c) F.S d) l/dt

15. Which one is more elastic?

a) Rubber b) Steel c) Both A&B d) None of the above

16. The maximum constant velocity acquired by a body while falling freely through a viscous medium is called___.

a) Thrift velocity b) Terminal velocity

c) Turbulent flow d) Steam lined velocity

17. The force b/w the atoms element is called____.

a) Gravitational force b) Friction force

c) Inter atomic force d) Tension force

18. The size of on air bubble rising up in water___.

a) Decrease b) Increase

c) Remains same d) May increase or decrease

19. In a pressure cooker the food is cooked faster because of _____.

a) Increased pressure lower boiling points

b) Increased pressure rises boiling points

c) Decreased pressure rise boiling points

d) Increased pressure lower melting point

20. The instruments used measure atmospheric pressure_____.

a) Anemometer b) Barometer c) Ammeter d) Voltmeter

21. A drinking straw works on the existence of___.

a) Pressure b) Velocity c) Viscosity d) Force

22. Milk density to measure_____.

a) Anemometer b) Lactometer c) Ammeter d) Hydrometer

23.According to Pascal's law_____.

a) Velocity b) Pressure c) Mass d) Density

24. Angle of contact silver and glass_____.

a) 0^0 b) 90^0 c)120^0 d)180^0

25. Angle of contact pure water and glass_____.

a) 0^0 b) 90^0 c) 120^0 d)180^0

26. The force is_____quantity.

a) Scalar b) Vector

c) Both A and B d) None of the above

27. The unit of work_____.

a) Watt b) Joule c) Density d) Kg

28. The force between like molecules which hold liquid together is_____.

a) Nuclear force b) Cohesive force c)Adhesive force
d) None of the above

29. The liquid contact solid molecule of the solid and liquid will experience an attractive force is called_____.

a) Nuclear force b) Cohesive force

c) Adhesive force d) None of the above

30. The 5th state of matter?

a) Gas b) Plasma

c) Liquid d) Bose-Einstein contentsate

31. Earth has about (2/3) of water and of land?

a) (1/3) b) (1/7) c) (1/4) d) none of these

32. The pressure is ___quantity?

a) Scalar b) vector c) both a and b d) none of these

33. The density of fluids is defined as _____per unit volume.

a) Parameter b) mass c) density d) volume

34. This force is always _____to the surface of the object.

a) Perpendicular b) normal c) either a or b d) none of these

35. If the_____in a liquid is changed at a particular point the change is transmitted to the entire Liquid.

a) Pressure b) density c) volume d) velocity

36. The stress = _____.

a) force/area b) force/action c) weight/force d) none of these

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)	Set	Roll Number	Subject
	A B C D	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Mobile Number	Test ID
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

1	A	B	C	D	26	A	B	C	D	51	A	B	C	D	76	A	B	C	D
2	A	B	C	D	27	A	B	C	D	52	A	B	C	D	77	A	B	C	D
3	A	B	C	D	28	A	B	C	D	53	A	B	C	D	78	A	B	C	D
4	A	B	C	D	29	A	B	C	D	54	A	B	C	D	79	A	B	C	D
5	A	B	C	D	30	A	B	C	D	55	A	B	C	D	80	A	B	C	D
6	A	B	C	D	31	A	B	C	D	56	A	B	C	D	81	A	B	C	D
7	A	B	C	D	32	A	B	C	D	57	A	B	C	D	82	A	B	C	D
8	A	B	C	D	33	A	B	C	D	58	A	B	C	D	83	A	B	C	D
9	A	B	C	D	34	A	B	C	D	59	A	B	C	D	84	A	B	C	D
10	A	B	C	D	35	A	B	C	D	60	A	B	C	D	85	A	B	C	D
11	A	B	C	D	36	A	B	C	D	61	A	B	C	D	86	A	B	C	D
12	A	B	C	D	37	A	B	C	D	62	A	B	C	D	87	A	B	C	D
13	A	B	C	D	38	A	B	C	D	63	A	B	C	D	88	A	B	C	D
14	A	B	C	D	39	A	B	C	D	64	A	B	C	D	89	A	B	C	D
15	A	B	C	D	40	A	B	C	D	65	A	B	C	D	90	A	B	C	D
16	A	B	C	D	41	A	B	C	D	66	A	B	C	D	91	A	B	C	D
17	A	B	C	D	42	A	B	C	D	67	A	B	C	D	92	A	B	C	D
18	A	B	C	D	43	A	B	C	D	68	A	B	C	D	93	A	B	C	D
19	A	B	C	D	44	A	B	C	D	69	A	B	C	D	94	A	B	C	D
20	A	B	C	D	45	A	B	C	D	70	A	B	C	D	95	A	B	C	D
21	A	B	C	D	46	A	B	C	D	71	A	B	C	D	96	A	B	C	D
22	A	B	C	D	47	A	B	C	D	72	A	B	C	D	97	A	B	C	D
23	A	B	C	D	48	A	B	C	D	73	A	B	C	D	98	A	B	C	D
24	A	B	C	D	49	A	B	C	D	74	A	B	C	D	99	A	B	C	D
25	A	B	C	D	50	A	B	C	D	75	A	B	C	D	100	A	B	C	D

Candidate's Signature

Invigilator's Signature

UNIT- 4

BLOOD

Blood:

Blood is the main circulatory medium in the human body. It is colored fluid connective tissue.

Components of Blood:

The blood consists of two main components. The fluid plasma and the formed elements (blood cells) which are found suspended in the plasma.

Plasma:

It is slightly alkaline, containing non-cellular substance which constitutes about 55% of the blood.

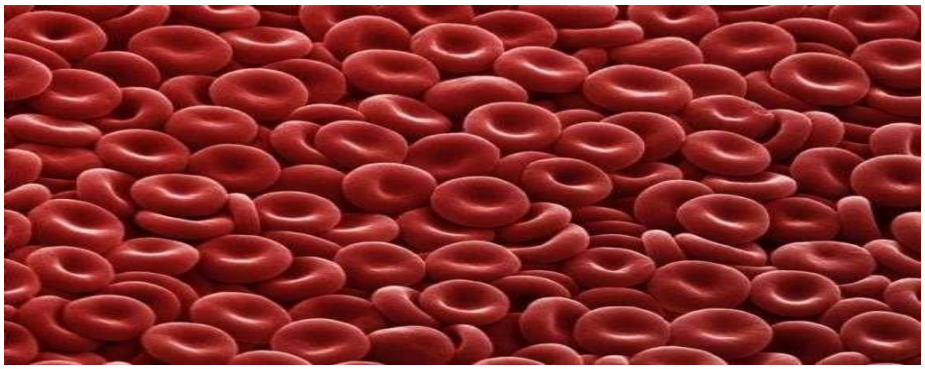
Organic substances like proteins, glucose, urea, enzymes, hormones, vitamins and minerals are present in the plasma**.**

Formed Elements of Blood:

Blood corpuscles are of three types

1. Red blood corpuscles (RBC) or Erythrocytes
2. White blood corpuscles (WBC) or Leucocytes
3. Blood plate lets or Thrombocytes

Red blood corpuscles (Erythrocytes)



They are the most abundant cells in the human body. RBCs are formed in the bone marrow.

The RBCs imparted colour to the blood due to

Presence of respiratory pigment hemoglobin.

Matured mammalian RBCs do not have cell organelles and nucleus.

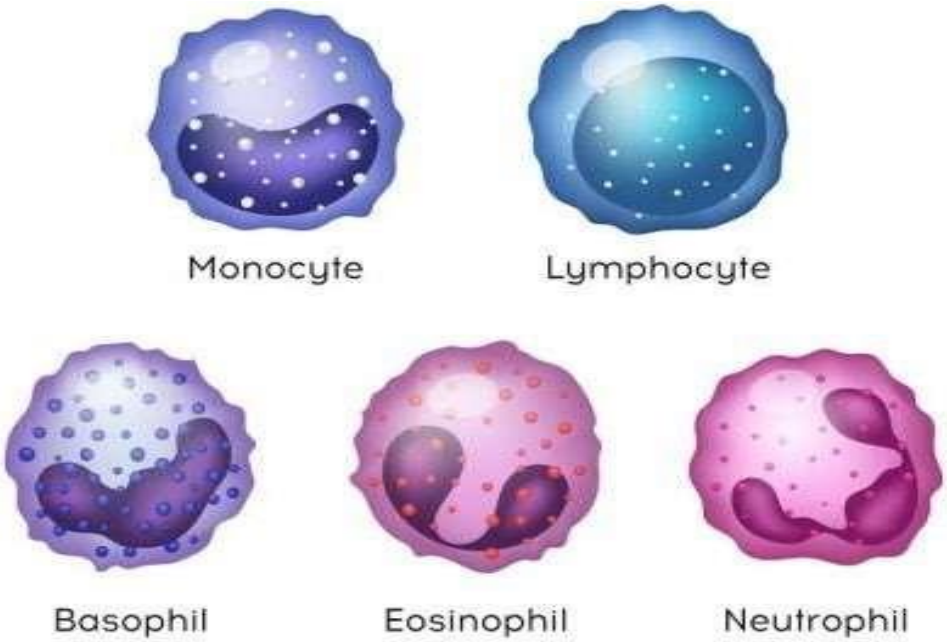
They are biconcave and disc-shaped. Their life spans about 120days. RBC is involved in the transport of oxygen from lungs to tissues.

DO YOU KNOW

Why does mammalian RBC lack cell organelles and nucleus?

Mammalian RBC lack nucleus and makes the cells biconcave and increase surface area for oxygen binding, loss of mitochondria allows the RBC to transport all the oxygen to tissues, and loss of endoplasmic reticulum allows more flexibility for RBC to move through the narrow capillaries.

White blood corpuscles (Leu cocytes)



WBC's are colorless. They do not have hemoglobin and are nucleated cells. It is found in the bone marrow, spleen, thymus and lymph nodes.

They are capable of amoeboid movement Erythrocytes.

The white blood corpuscles can be grouped into two categories:

1. Granulocytes
2. A granulocytes.

Granulocytes

They contain granules in their cytoplasm. Their nucleus is Irregular or lobed.

The granulocytes are of three types

(i) Neutrophils (ii) Eosinophils (iii) Basophils

(i) Neutrophils:

They are large in size and have a 2 -7 lobed nucleus. These corpuscles form 60%-65% of the total leucocytes. Their numbers are increased during infection and inflammation.

(ii) Eosinophils:

It has a bilobed nucleus and constitute 2% - 3% of the total leucocytes. Their number increases during conditions of allergy and parasitic infections. It brings about detoxification of toxins.

(iii) Basophils:

Basophils have lobed nucleus. They form 0.5-1.0% of the total leucocytes. They release chemicals during the process of inflammation.

Agranulocytes

Granules are not found in the cytoplasm of these cells.

The agranulocytes are of two types:

(i) Lymphocytes

(ii) Monocytes

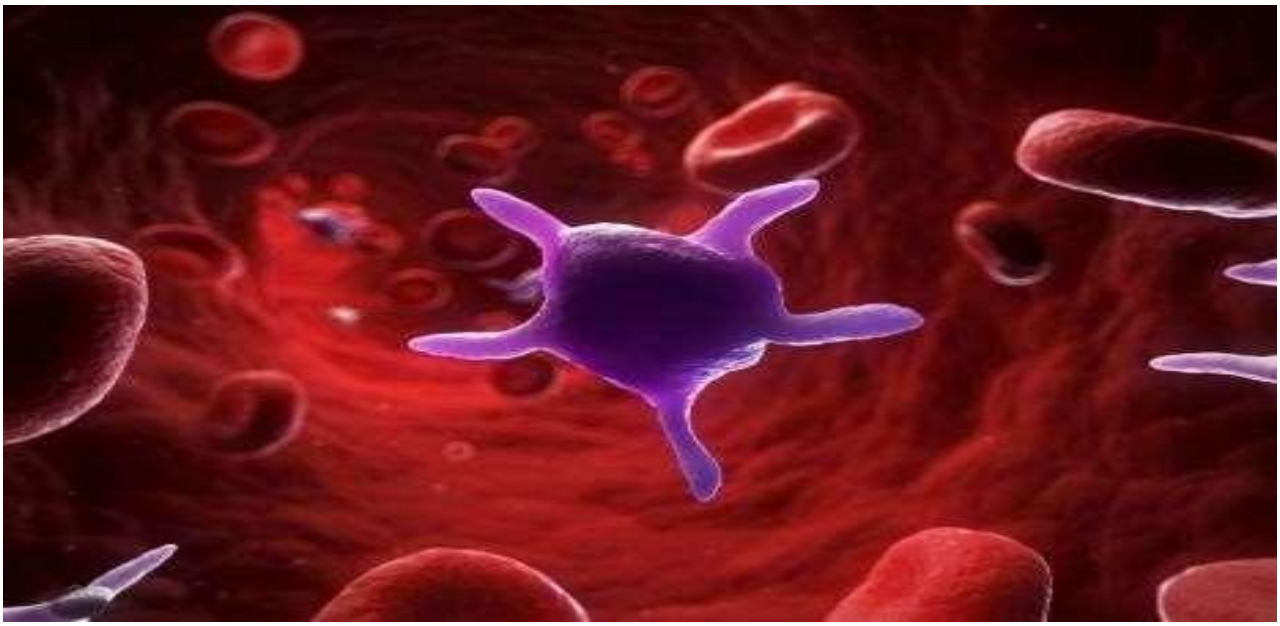
(i)Lymphocytes:

These are about 20-25% of the total leucocytes. They produce antibodies during bacterial and viral infections.

(ii) Monocytes:

They are the largest of the leucocytes and are amoeboid in shape. These cells form 5-6% of the total leucocytes. They are phagocyte and cane n gulf bacteria

Blood Platelets or Thrombocytes:



These are small and colorless. They do not have nucleus. There are about 2,50,000-4,00,000 platelets / cubic mm of blood. Life span of platelets is 8-10 days. They play an important role in clotting of blood. Platelets form clot at the site of injury and prevent blood loss.

More to Know

Anaemia: Decrease in number of erythrocytes.
Leucocytosis: Increase in the number of leukocytes.
Leukopenia: Decrease in number of leukocytes.
Thrombocytopenia: Decrease in the number of thrombocytes.

Functions of blood

(i) Transport of respiratory gases (OxygenandCO2).

(ii) Transport of digested food materials to the different body cells.

(iii) Transport of hormones.

(iv) Transport of nitrogenous excretory products like ammonia, urea and uric acid.

(v) It is involved in protection of the body and defense against diseases.

(vi) It acts as buffer and also helps in regulation of pH and body temperature.

(vii) It maintains proper water balance in the body.

Blood pressure

Is the force exerted during the flow of blood against the lateral walls of arteries. The blood pressure is high in the arteries gradually drops in the arterioles and capillaries and become very low in the veins**.**

Blood pressure is usually expressed in terms of the systolic pressure and diastolic pressure.

Systolic pressure:

During ventricular systole, the left ventricle contracts and forces blood into the aorta. The pressure rises to a peak which is referred as systolic pressure.

Diastolic pressure:

During diastole, the ventricles relax and the pressure falls to the lowest value which is referred as diastolic pressure.

In an healthy adult during normal resting condition systolic and diastolic blood pressure is expressed as 120mm / 80mm Hg.

Blood pressure varies during conditions of physical exercise, anxiety, emotions, stress and sleep.

A prolonged or constant elevation of blood pressure is a condition known as hypertension (High blood pressure) can increase the risk of heart attack and stroke. Decrease in blood pressure is termed hypotension (Low blood pressure).

Stethoscope

As stethoscope is used to detect the sound produced by the internal organs of human body. The heart sound is heard by placing the stethoscope on the chest.

It is a useful diagnostic tool to identify and localize health problems and diagnose disease. The modern electronic stethoscopes are high precisioned instruments.

Sphygmomanometer

Sphygmomanometer is a clinical instrument used to measure blood pressure when a person is in a relaxed and resting condition.

The pressure of the brachial artery is measured. It helps to estimate the state of blood circulation and the working of the heart.

It helps to diagnose conditions such as increased or decreased blood pressure. Monometric and modern digital types are the apparatus used to measure blood pressure.

Blood Groups

The concept of blood grouping was developed by Karl

Landsteiner (1900). He identified blood Groups A, B and O. AB blood group was recognized by Decastello and Sturli (1902)

Human blood contains certain specific substances called agglutinogens or antigens (Ag) and agglutinins or antibodies (Ab).

Antigens are found on the membrane surface of RBC. Antibodies are present in blood plasma.

Based on the presence or absence of antigen and antibodies human blood group is classified into four groups called A, B, AB and O. An individual has one of the four blood groups.

(i) "A" group individuals: Antigen A is present on the surface of RBC and antibody b (anti-b) is present in the plasma.

(ii) "B" group individuals: Antigen B is present on the surface of RBC and antibody a (anti - a) is present in the plasma.

(iii) "AB" group individuals: Antigens A and B are present on

the surface of RBC and both the antibodies are absent in the plasma.

(iv) "O" group individuals: Antigen A or B are absent on the

surface of RBC. However, the plasma contains both the antibodies a and b (anti a and b).

Blood donation

In blood transfusion one must consider the antigen and antibody compatibility (matching) between the donor and the person receiving blood (recipient).

When an individual receives a mismatched blood group from the donor agglutination (clumping) of blood occurs in the body which leads to death.

Persons with "AB" blood group are called "Universal Recipient" as they can receive blood from persons with any blood group.

Persons with "O" blood group are called "Universal Donor" as they can donate blood to persons with any blood group.

Rh factor

Rh factor was discovered by Landsteiner and Wienerin 1940 in Rhesus monkey. The surface of RBC contains the antigen for Rh factor.

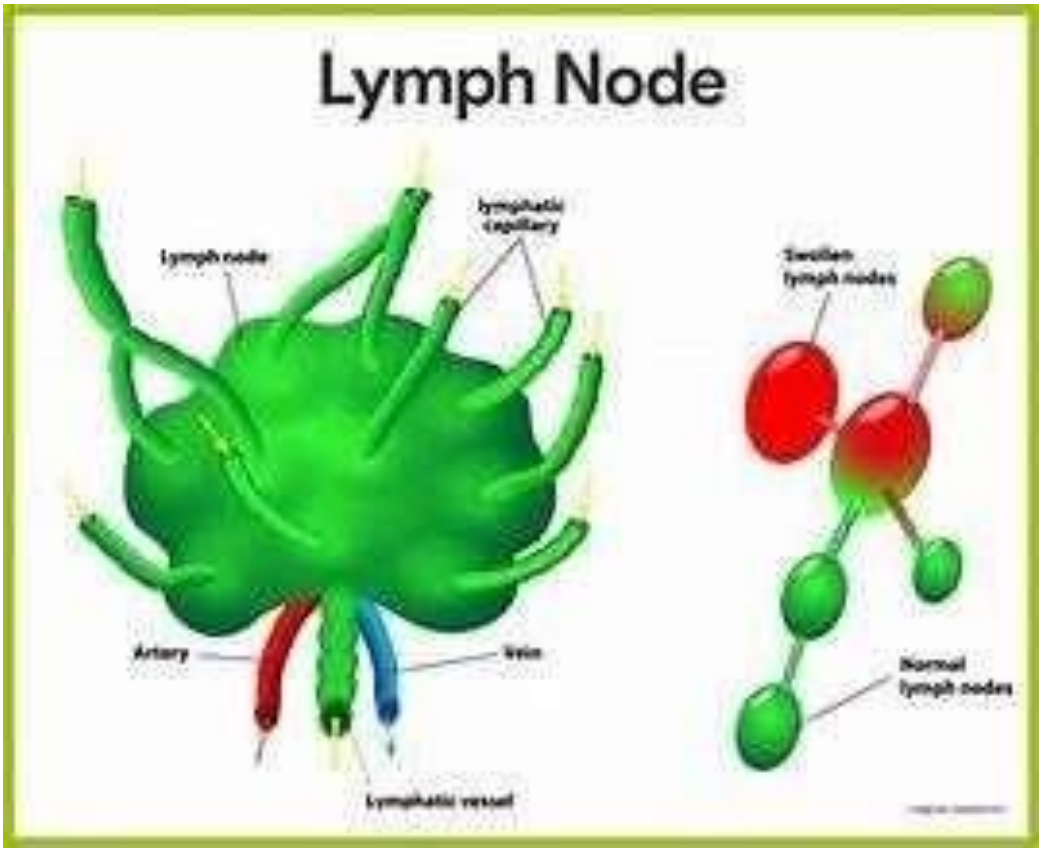
Rh+(positive) persons have Rh antigen on the surface of RBC while, Rh–(negative) persons do not have Rh antigen on the surface of RBC. Anti bodies developed against this Rh antigen is called Rh antibodies.

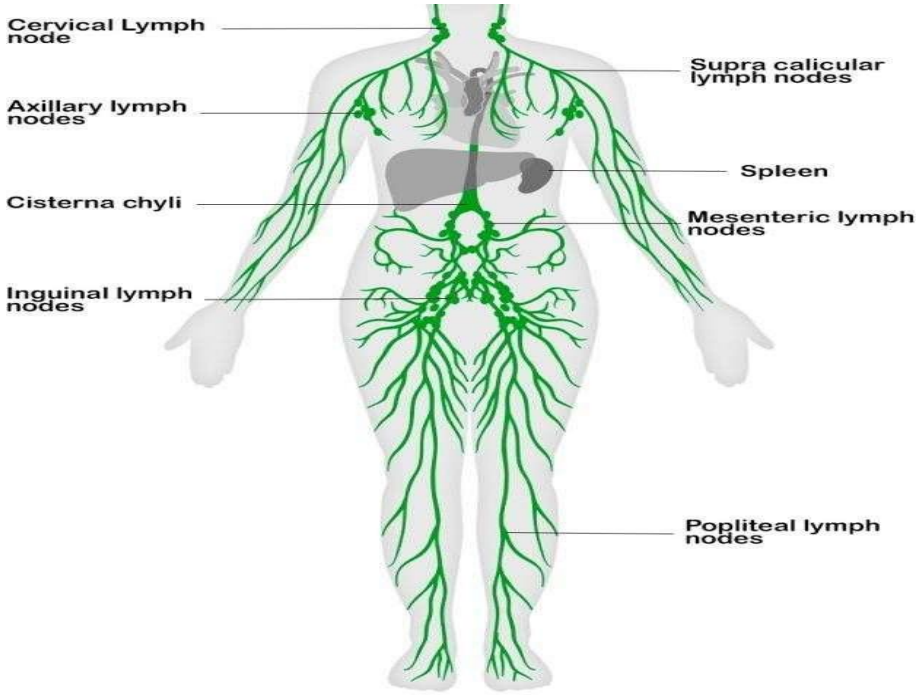
Blood Group	Antigens on RBC	Antibodies in Plasma	Can donate to	Can receive from
A	Antigen A	anti- b	A and AB	A and O
B	Antigen B	anti- a	B and AB	B and O
AB	Antigen A and B	No antibody	AB	A, B, AB and O (Universal Recipient)
O	No Antigen	Both anti a and b	A, B, AB and O (Universal Donor)	O

Lymphatic System

The lymphatic system comprises of lymphatic capillaries, lymphatic vessels, lymph nodes and lymphatic ducts. Lymph is the fluid that flows through the lymphatic system. The lymphatic capillaries unite to form large lymphatic vessels.

Lymph nodes are small oval or pear shaped structures located along the length of lymphatic vessel.


Lymph Node
Lymph node
Artery
Vein
Lymphatic vessel
Normal
lymph nodes


Cervical Lymph node
Axillary lymph nodes
Cisterna chyli
Inguinal lymph nodes
Supra calicular lymph nodes
Spleen
Mesenteric lymph nodes
Popliteal lymph nodes

Lymph

Lymph from the inter cellular spaces drains into lymphatic capillaries. Lymphis a colorless fluid formed when plasma, proteins and blood cells escape into intercellular spaces in the tissues through the pores present in the walls of capillaries.

It is similar to blood plasma, but is colorless and contains less proteins. The lymph contains very small amount of nutrients, oxygen, CO2, water and WBC

Functions of Lymph

- Supplies nutrients and oxygen to those parts where blood cannot reach
- It drains away excess tissue fluid and metabolites and returns proteins to the blood from tissue spaces.
- The lymph also carries absorbed fats from small intestine to the blood. The lymphatic capillaries of intestinal villi (lacteals) absorb digested fats.
- Lymphocytes in the lymph defend the body from infections.

CHOOSE THE CORRECT ANSWER:

1. ___Is the main circulatory medium in the human body?

   a) Blood b) tissues c) lymph d) none of these

2. Plasma constitute about _____% of the blood?

   a) 45 b) 55 c) 78 d) 67

3. The Red blood corpuscles (RBC) is also known as___

   a) Erythrocytes b) Leucocytes

   c) Thrompocytes d) none of these

4. The life span of RBC is__days

a) 120 b) 124 c) 136 d) 156

5. Persons with “AB” blood group are called_

a) Universal recipient b) universal donor

c) both a and b d) none of these

6. Persons with “O” blood group are called__

a) Universal recipient b) universal donor

c) both a and b d) none of these

7. The concept of blood grouping was developed by____

a) Karl Landsteiner b) Mendel

c) Louis pastor d) none of these

8. _____ is used to detect the sound produced by the internal organs of human body.

a) lactometer b) stethoscope

c) sphygmomanometer d) cardiogram

9. Decrease in number of Thrompocytes is called_____

a) leucocytosis b) anemia

c) leucopenia d) thrombocytopenia

10. _____is a clinical instrument used to measure blood pressure

a) lactometer b) stethoscope

c) Sphygmomanometer d)cardiogram

11. Antibodies developed against this Rh antigen is called_____

a) Rh antibodies b) Hr antibodies

c) Sr antibodies d) none of these

12. Life span of platelets is _

a) 8–10days b) 12-13days c) 11-15days d) 12-17days

13. The lymphatic system comprises of

a) Lymphatic capillaries b) lymphatic vessels
c) lymph nodes d) all of these

14. Decrease in number of leukocytes is called_____

a) leucocytosis b) anemia c) leucopenia d)thrombocytopenia

15. Decrease in number of erythrocytes is called_____

a) anaemia b) Leucocytes c) Thrombocytes d) none of these

16. The RBCs imparted colour to the blood due to presence of respiratory pigment_____

a) Chlorophyll b) hemoglobin c) erythrocytes d) Both a and b

17. In an healthy adult during normal resting condition systolic and diastolic blood pressure is expressed as _____

a) 120mm/80mmHg b) 130mm/80mmHg

c) 140mm/80mHg d) none of these

18. Increase in the number of leukocytes is called _____.

a) leucocytosis b) anemia

c) leucopenia d) thrombocytopenia

19. Lymph is a _____ fluid.

a) Colorless b) colorful c) grey colored d) none of these

20. _____ in the lymph defend the body from infections.

a) Adenosine b) cartenoids c) Lymphocytes d) none of these

OMR HOME
A COMPLETE OMR SOLUTIONS

OMR SHEET

Student's Name (In Block Letters Only)

Set

Roll Number

Subject

Mobile Number

Test ID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D
39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D
56	A	B	C	D
57	A	B	C	D
58	A	B	C	D
59	A	B	C	D
60	A	B	C	D
61	A	B	C	D
62	A	B	C	D
63	A	B	C	D
64	A	B	C	D
65	A	B	C	D
66	A	B	C	D
67	A	B	C	D
68	A	B	C	D
69	A	B	C	D
70	A	B	C	D
71	A	B	C	D
72	A	B	C	D
73	A	B	C	D
74	A	B	C	D
75	A	B	C	D

76	A	B	C	D
77	A	B	C	D
78	A	B	C	D
79	A	B	C	D
80	A	B	C	D
81	A	B	C	D
82	A	B	C	D
83	A	B	C	D
84	A	B	C	D
85	A	B	C	D
86	A	B	C	D
87	A	B	C	D
88	A	B	C	D
89	A	B	C	D
90	A	B	C	D
91	A	B	C	D
92	A	B	C	D
93	A	B	C	D
94	A	B	C	D
95	A	B	C	D
96	A	B	C	D
97	A	B	C	D
98	A	B	C	D
99	A	B	C	D
100	A	B	C	D

Candidate's Signature

Invigilator's Signature

Supported by:

MANAGEMENT COMMITTEE

Mr. G.NAGARAJAN, B.A.,(FOUNDER)

Mrs. N. BRAHADAMBAL, B.A., (CORRESPONDENT)

Rtn.Dr. N.MURALIDHARAN, M.A., M.Phil, B.Ed., D.Litt, (USA) (PRINCIPAL)

Mrs. S.ARUNA MURALIDHARAN, M.Sc., B.Ed., M.Phil, (VICE-PRINCIPAL)

ADMINISTRATIVE COMMITTEE

NALLASIRIYAR Mrs. R.KAMALA, B.Sc., B.Ed., (VICE - PRINCIPAL)

NALLASIRIYAR Mrs. N.VIJAYALAKSHMI, M.A., B.Ed., (VICE - PRINCIPAL)

Mrs. S.BHUVANESHWARI, B.A., B.Ed.,(VICE - PRINCIPAL)

NALLASIRIYAR Mr. A.RAJADURAI, M.Sc., M.Phil., B.Ed., (CO -ORDINATOR)

Mrs. V.KAVITHA, M.Sc., B.Ed., (CO-ORDINATOR)

Our sincere thanks to:

- **Mr. P.KUMARAVELU, M.Sc., M.Phil., B.Ed.,**
- **Ms. S.DURGA, M.Sc., B.Ed.,**
- **Mrs. T.SHOBANA, M.Sc., B.Ed.,**
- **Ms. K.ELAKKIYA, M.Sc., B.Ed.,**

First Edition : April – 2022

Second Edition: April–2024

Revised Edition : April – 2025

Edited & Revised by:

Ms. S. ATCHAYA, M.Sc., DCA.,

Ms. S. NIRANJANA, B.Sc.,

Copy Right:

NEW BHARATH EDUCATIONAL AND CHARITABLE TRUST, THIRUVARUR

Publication:

NEW BHARATH SIRAGUGAL.

"LIFE IS A MATH EQUATION .IN ORDER TO GAIN THE MOST,

YOU HAVE TO KNOW HOW TO CONVERT NEGATIVES INTO POSITIVES."

—ANONYMOUS

"ALL OF SCIENCE IS NOTHING MORE THAN THE

REFINEMENT OF EVERYDAY THINKING."

-ALBERT EINSTEIN

PERIODIC TABLE OF THE ELEMENTS

Atomic number	11
Symbol	Na
Name	Sodium
Atomic mass	22.990

- Alkali metals
- Alkaline earth metals
- Transition metals
- Post-transition metals
- Metalloids
- Reactive nonmetals
- Noble gases
- Lanthanides
- Actinides

PERIOD \ GROUP	1 IA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	1 H Hydrogen 1.008																2 He Helium 4.0026
2	3 Li Lithium 6.94	4 Be Beryllium 9.012										5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
3	11 Na Sodium 22.990	12 Mg Magnesium 24.305										13 Al Aluminum 26.982	14 Si Silicon 28.085	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948
4	19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	30 Cu Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798
5	37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
6	55 Cs Cesium 132.91	56 Ba Barium 137.33	57–71	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89–103	104 Rf Rutherfordium (267)	105 Db Dubnium (268)	106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (277)	109 Mt Meitnerium (278)	110 Ds Darmstadtium (281)	112 Rg Roentgenium (282)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (290)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)

57–71 LANTHANIDES	57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.05	71 Lu Lutetium 174.97
89–103 ACTINIDES	89 Ac Actinium (227)	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (266)

Atomic masses in parentheses are those of the most stable or common isotope.

Standard atomic weights as of 2024 (IUPAC)