PREFACE

What is Knowledge Bytes ?

Knowledge Bytes is a collection of riddles, interesting facts, mnemonics, and puzzles that will make your learning fun and engaging.

We want you to be delighted about studying. Knowledge Bytes helps you to know more about the subject in a fun, motivating and educational way and helps to implement what you learn in a creative way.

Benefits

Saves Time

Develops Learning Skills

Stimulates Interest

Leads to Increased Comprehension

EXPLORE

Polynomials

ACROSS

1 An algebraic expression is a combination of constants and _____. [9]

3 Every linear polynomial has only one _____. [4]

5 If $(x - \alpha)$ is a _____ of f(x), then f(α) = 0. [6]

7 (x + a) is a factor of $x^n - a^n$, where n is an _____ positive integer. [4]

8 Number of distinct _____ of a polynomial p(x) is equal to the number of times the graph of polynomial cuts or touches the x-axis. [6]

10 Degree of remainder is always _____ the degree of the divisor. [8]

DOWN

2 Degree of zero polynomial is _____. [10]

4 The _____, when f(x) = x^4 + 1 is divided by (x − 2) is 17. [9]

6 (x + a) is a factor of $x^n + a^n$, when n is an _____ positive integer. [3]

9 _____ of polynomial determines the maximum number of real zeroes of the polynomial. [6]

11 If polynomial p(x) is divided by (x − 2), then the remainder is a _____ or zero. [8]
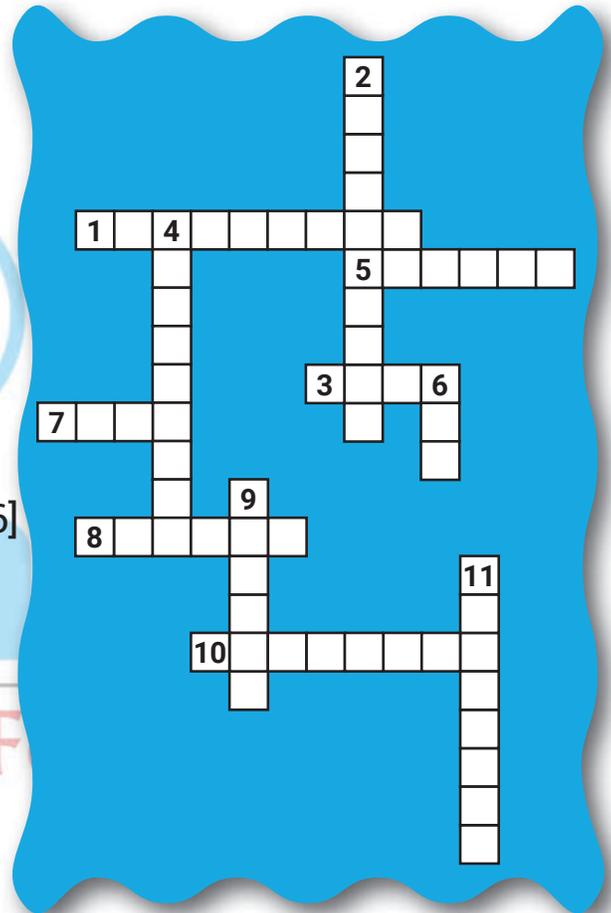
Here is the trick

PASCAL'S TRIANGLE

1	→ Row 1
1 1	→ Row 2
1 +2 1	→ Row 3
1 +3 +3 1	→ Row 4
1 +4 +6 +4 1	→ Row 5
1 5 10 10 5 1	→ Row 6
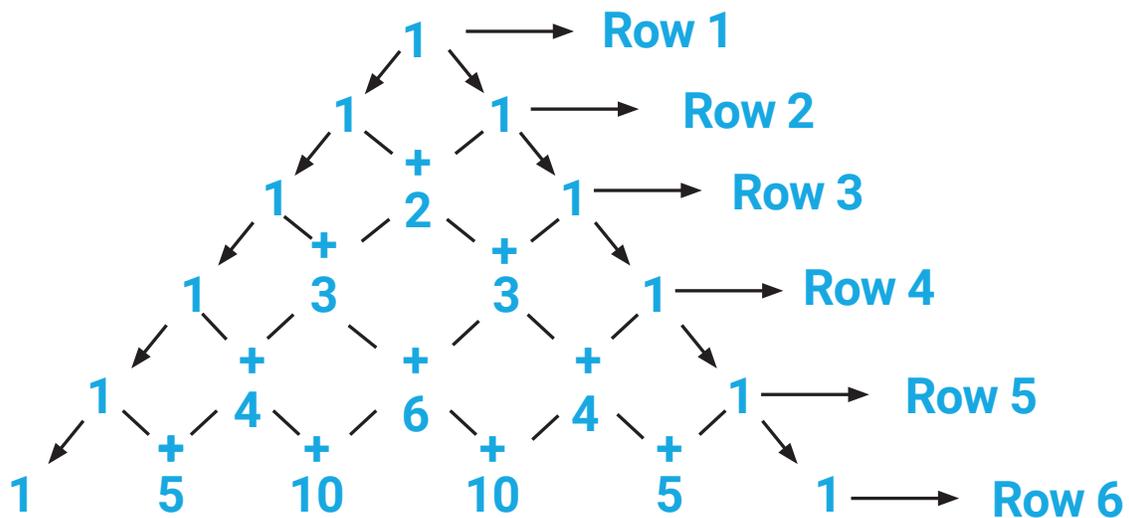
Let us discuss the identities one by one

i   Now, let us see $(a + b)^2$

◆ Since the degree is 2, the number of terms in the resulting expression will be 2 + 1.
i.e.   3 terms.

◆ Now, checking Pascal's Triangle with 3 terms, we can identify the coefficient of the terms of resulting expression.

```
                1
            1       1
        1       2       1    ⟶  Row 3
      1     3       3     1
    1     4     6     4     1
  1     5   10    10    5     1
```
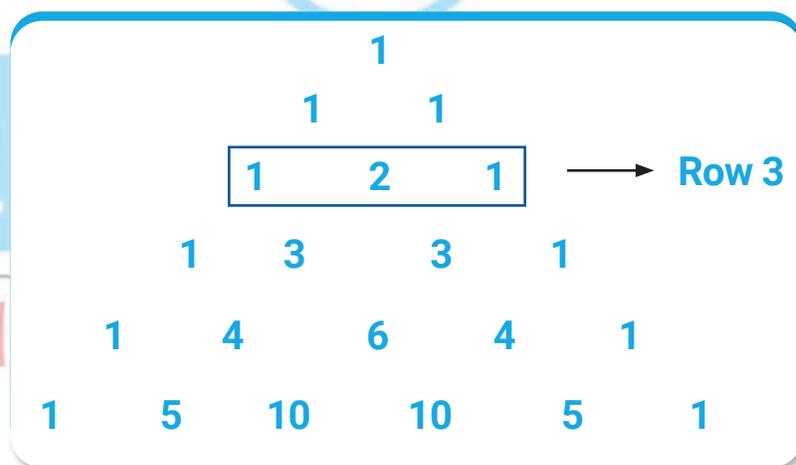
◆ As we have '+' in the expression, so we will write '+' in all the terms.
i.e.   1 + 2 + 1

◆ We will now, multiply variables a and b with these coefficient. As 'a' is the first variable we will start with 'a'. Multiply 'a' in the decreasing order of its power with all the coefficients starting from 2 because degree is 2.
i.e. $1a^2 + 2a^1 + 1a^0$

◆ Now, multiply 'b' with increasing order of its power starting from zero.
i.e. $(a + b)^2 = 1a^2b^0 + 2a^1b^1 + 1a^0b^2$
$$= a^2 + 2ab + b^2$$

ii Now, $(a + b)^3$

◆ No. of terms = 3 + 1 = 4

◆ Coefficients from Pascal's Triangle.
i.e. 1 3 3 1

◆ As it is $(a + b)^3$, so we will write '+' in between these coefficients.
i.e. 1 + 3 + 3 + 1

```
                1
            1       1
        1       2       1
    1       3       3       1
1       4       6       4       1
1   5       10      10      5       1
```

◆ Now, multiply 'a' in decreasing order of its power starting from 3 with all the coefficient and multiply 'b' in increasing order of its power starting from zero till 3 as degree is 3.

i.e. $(a + b)^3 = 1a^3b^0 + 3a^2b^1 + 3a^1b^2 + 1a^0b^3$
$= a^3 + 3a^2b + 3ab^2 + b^3$
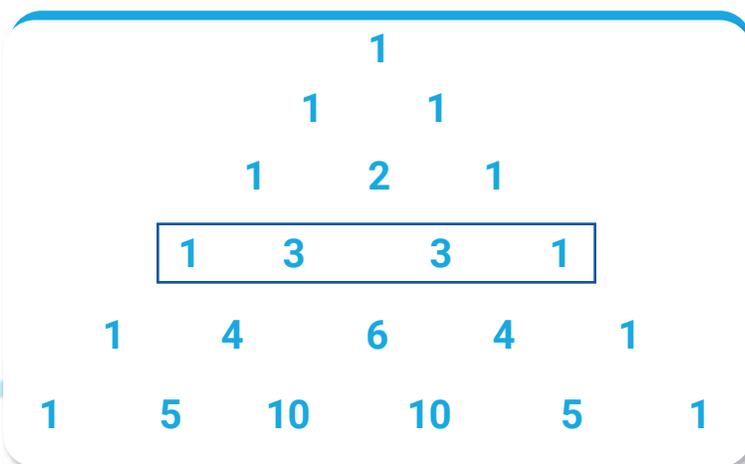
iii Now, $(a - b)^2$

◆ No. of terms will be = 2 + 1 = 3

◆ Coefficients from Pascal's Triangle i.e. 1   2   1 same as that of $(a + b)^2$.

◆ But sign of the terms will be + and − alternatively.
i.e. +1 − 2 + 1

◆ Multiplying a and b with each term in decreasing order and increasing order of their power respectively.
i.e. $(a - b)^2 = 1a^2b^0 - 2a^1b^1 + 1a^0b^2$
$= a^2 - 2ab + b^2$

Do it yourself ☞ $(a - b)^3$

4

◆ Let us discuss $= (a^3 + b^3)$

This identity can be derived easily from $(a+b)^3$ identity simply by transposing terms.

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

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

$\Rightarrow a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

$\qquad = (a + b)[(a + b)^2 - 3ab]$

$\qquad = (a + b)[a^2 + b^2 + 2ab - 3ab]$

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

Similarly, we can find $a^3 - b^3$ from $(a - b)^3$ identity

Answer (Crossword)

Across:
- 1 VARIABLES
- 5 FACTOR
- 3 ZERO
- 7 EVEN
- 8 ZEROES
- 10 LESSTHAN

Down:
- 2 NOTDEFINED
- 4 REMAINDER
- 6 ODD
- 9 DEGREE
- 11 CONSTANT
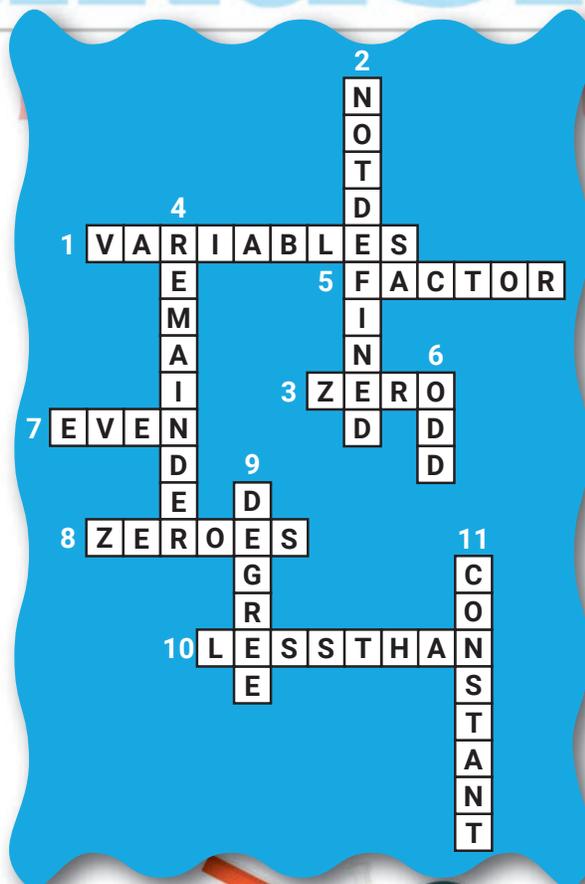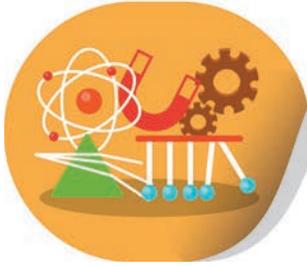
Motion

Crossword
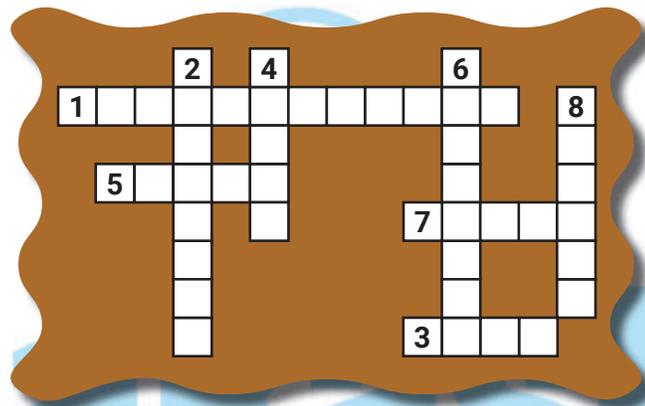
ACROSS

1. Rate of change of velocity. [12]
3. A body is said to be at _____ if it does not change its position w.r.t its surroundings with the passage of time. [4]
5. _____ of the velocity-time graph gives acceleration of an object. [5]
7. For your total displacement to be zero you must end up back from where you _____. [5]

DOWN

2. Speed in particular direction. [8]
4. SI unit of displacement. [5]
6. Speed is always _____. [8]
8. The physical quantity which has both magnitude as well as direction. [6]

Interesting Facts

1. **State of rest :** A body is said to be at rest if it does not change its position with respect to a fixed point taken as a reference point in its surroundings with the passage of time.

2. **State of motion :** A body is said to be in motion if it changes its position with respect to a fixed point taken as a reference point in its surroundings with the passage of time.

3. **Types of motion :** The various types of motion are rectilinear motion, curvilinear motion, rotatory motion, oscillatory motion and periodic motion.

4. **Mechanics :** The branch of physics which deals with the study of motion of objects and their response to force is called mechanics.

5. **Distance travelled :** The actual length of the path travelled by a moving body in a given interval of time irrespective of the direction in which the body travels is called the distance travelled by that body.

6. **Displacement :** The shortest distance measured between the initial position and the final position of a moving body in a particular direction is called its displacement.

7. **Uniform motion :** A body moving in a straight line has a uniform motion if it travels equal distances in equal intervals of time in a particular direction, no matter how small these time-intervals may be.

8. **Non-uniform motion :** A body has a non-uniform motion if it travels unequal distances in equal intervals of time, no matter how small these time-intervals may be or its direction keep on changing.

9. **Average speed** $= \dfrac{\text{Total distance travelled}}{\text{Total time}}$

10. **Instantaneous speed :** The speed at any instant of time is called the instantaneous speed. It is equal to the magnitude of instantaneous velocity.

Identification of Types of Motion

_____ motion

_____ motion

_____ motion

_____ motion

_____ motion

Quiz Time

1 A particle is moving in a circular path of radius r. The displacement after half a circle would be

   (a) Zero   **(b)** πr

   (c) 2r   **(d)** $2\pi r$

2 A body is thrown vertically upward with velocity u, the greatest height h to which it will rise is

   (a) u/g   **(b)** $u^2/2g$

   (c) u^2/g **(d)** u/2g

3 The numerical ratio of displacement to distance for a moving object is

   (a) always less than 1   **(b)** always equal to 1

   (c) always more to 1   **(d)** equal or less than 1

4 If the displacement of an object is proportional to square of time, then the object moves with

   (a) uniform velocity   **(b)** uniform acceleration

   (c) increasing acceleration   **(d)** decreasing acceleration

5 From the given velocity (v)–time (t) graph, it can be inferred that the object is

   (a) in uniform motion

   (b) at rest

   (c) in non-uniform motion

   (d) moving with uniform acceleration

Answer (Crossword)

```
              2       4               6
              V       M               P               8
          1 A C C E L E R A T I O N   O               V
              L       T               S               E
          5 S L O P E R               I               C
              O       E           7 S T A R T         T
              C                       I               O
              I                       V               R
              T                   3 R E S T
              Y
```
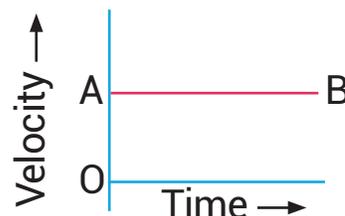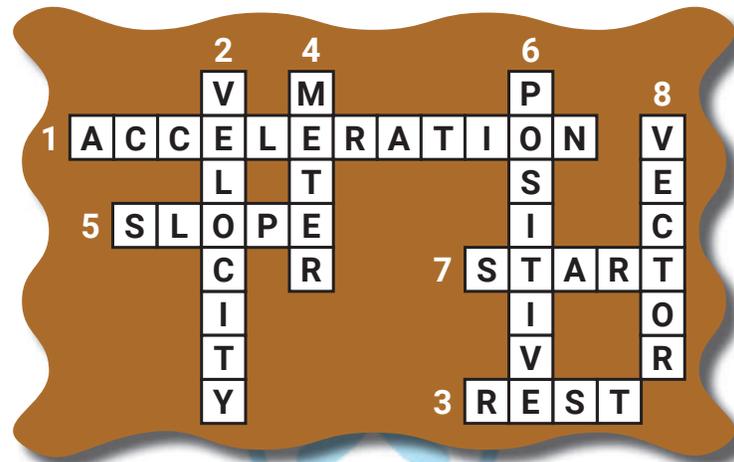
Answer (Identification of Types of Motion)

Curvilinear motion	Oscillatory motion	Rectilinear motion	Vibratory motion	Rotatory motion

Answer (Quiz Time)

1 **(c)** 2r   2 **(b)** $u^2/2g$ 3 **(d)** equal or less than 1

4 **(b)** uniform acceleration   5 **(a)** in uniform motion

Matter in Our Surroundings

Crossword

ACROSS

1. _____ is an example of sublimable solid. [7]

2. Ability of a substance to flow is known as _____. [8]

3. Boiling is a _____ phenomenon. [4]

4. Form of energy which enables the particles to move apart. [7, 6]

DOWN

5. _____ is a state of matter which has a definite volume but indefinite shape. [6]

6. Intermixing of particles of two different types of matter on their own. [9]

7. _____ is anything that has mass and occupies space. [6]

8. Solid CO_2 is commonly known as _____. [3, 3]

9. The process of conversion of liquid into solid. [8]

10. _____ is an example of super cooled liquid. [5]
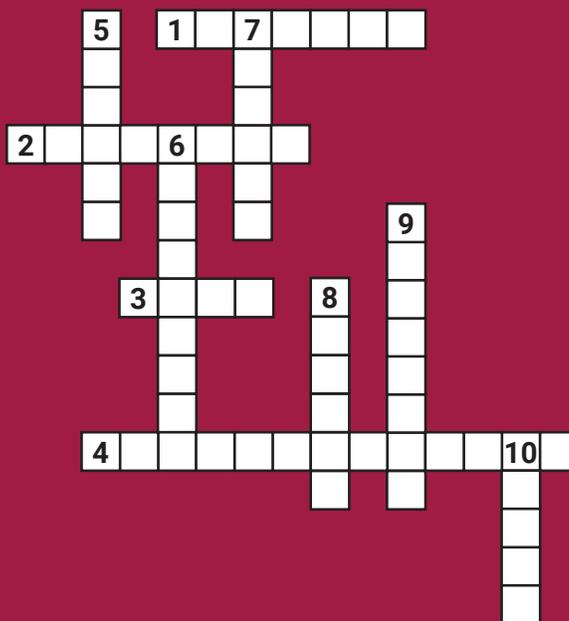
Interesting Facts

It's impossible to burp in space

In the absence of gravity, the gas cannot separate from the liquids and solids. So burping essentially turns into puking.

Is glass solid or liquid ?

Glass is basically an amorphous solid. It does not form a crystalline structure. So, the constituent particles of the glass can move. In regular solids, there is no movement of constituent particles under normal conditions.

Due to this property of fluidity, glass is called as supercooled liquid.

Glass can be considered as a liquid of extremely high viscosity. The evidence of the fact can be seen in the glass of windows getting thicker at bottom over a period of time.

Jumbled Words

The underlined word in the following sentences have been jumbled up. Write them in correct form.

1 Conversion of liquid to gaseous state is known as posavarnitoi.

2 Solids have negligible mssirepcotyiilb.

3 The measurable properties required to describe the state of the system are called tatse riavables.

4 Evaporation of water from leaves is known as sanoritarntpi.

5 tercleparinti forces of attraction between the particles tend to bring them closer.

6 The undetectable heat energy required to change the phase of a substance is known as tanlet teah.

7 SI unit of pressure is saplac.

8 The internal resistance to the flow in liquids is called sicsotivy.

9 aflem is an example of plasma.

Quiz Time

Q.1 **Normal body temperature is**

$\rightarrow$ **?K**

$\rightarrow$ **?°C**

$\rightarrow$ **98.6 °F**
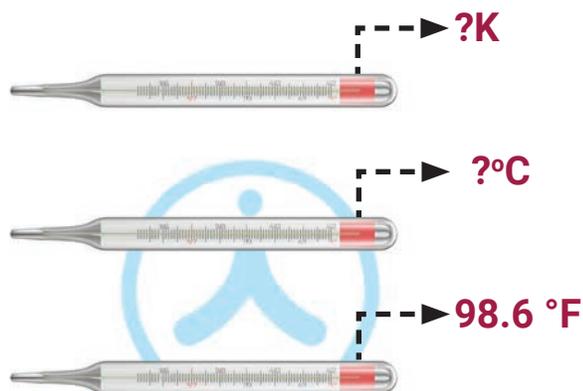
Q.2 **Name A, B, C, D, E and F in the following diagram showing change in its state**

Increase heat and decrease pressure

E

A | B

SOLID | LIQUID | GAS

D | C

F

Decrease heat and increase pressure

Answer (Crossword)

```
              5                  7
              L       1  C  A  M  P  H  O  R
              I                  A
              Q          6       T
           2  F  L  U  I  D  I  T  Y
              U          I       E
              I          F       R
              D          F
                         U       8     9
           3  B  U  L  K  S      D     F
                         I       R     R
                         O       Y     E
                                 I     E
           4  K  I  N  E  T  I  C  E  N  E  R  G  Y
                                 E     Z  10
                                       I  G  L
                                       N     A
                                       G     S
                                             S
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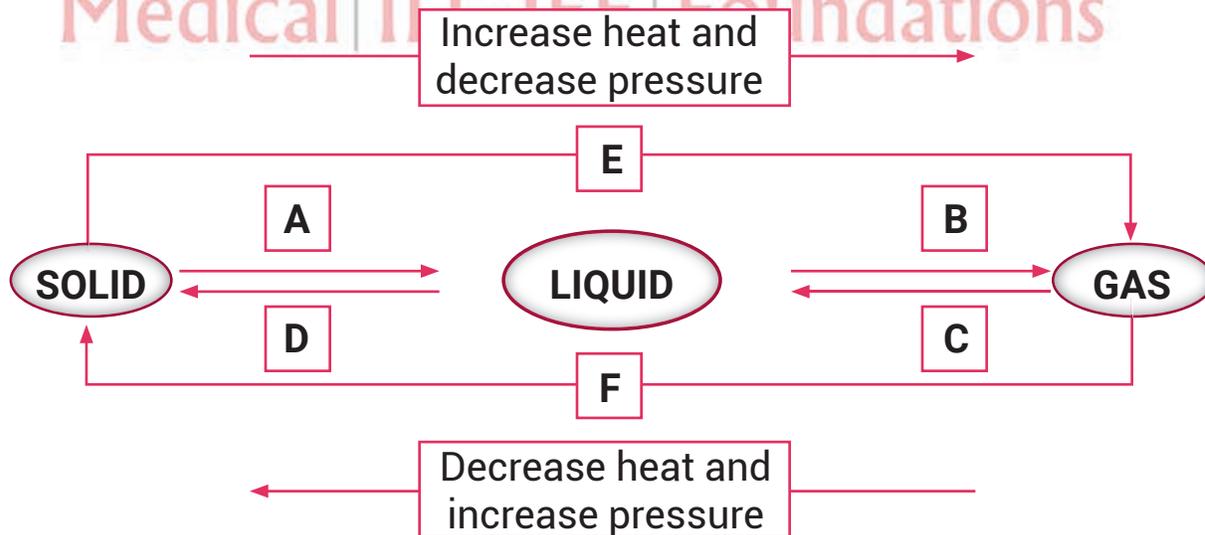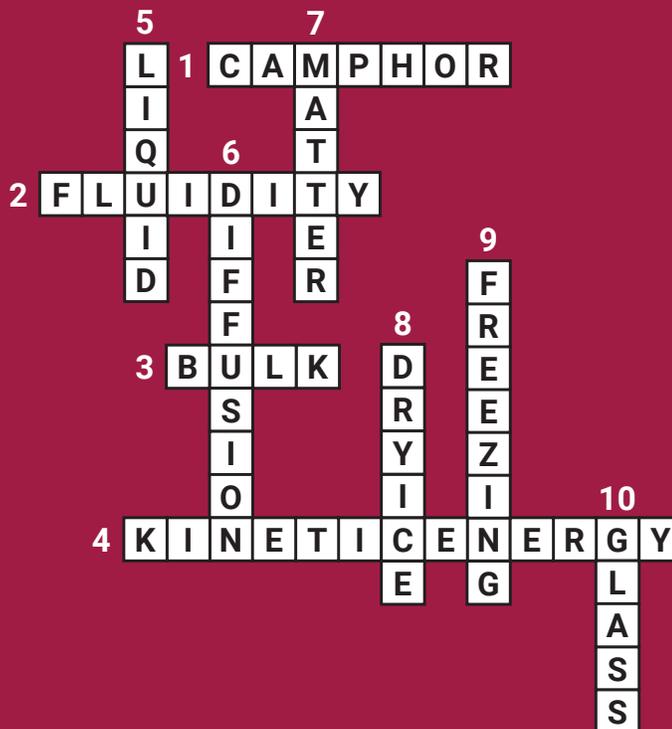
Answer (Jumbled Words)

1. Vaporisation
2. Compressibility
3. State variables
4. Transpiration
5. Interparticle
6. Latent heat
7. Pascal
8. Viscosity
9. Flame

Answer (Quiz Time)

A.1

310 K

37°C

98.6 °F

A.2

Increase heat and decrease pressure

Sublimation

SOLID	Melting or fusion	LIQUID	Vaporization	GAS
	Solidification		Condensation	

Deposition

Decrease heat and increase pressure
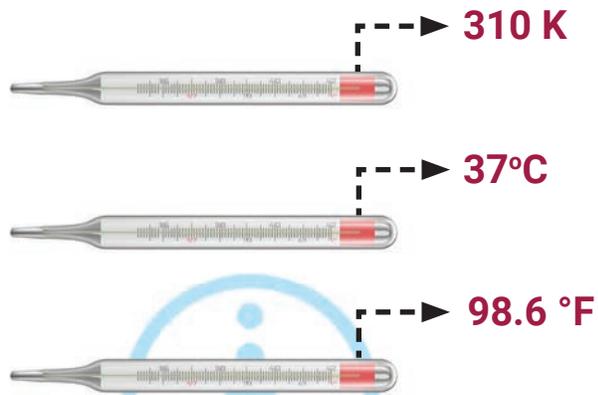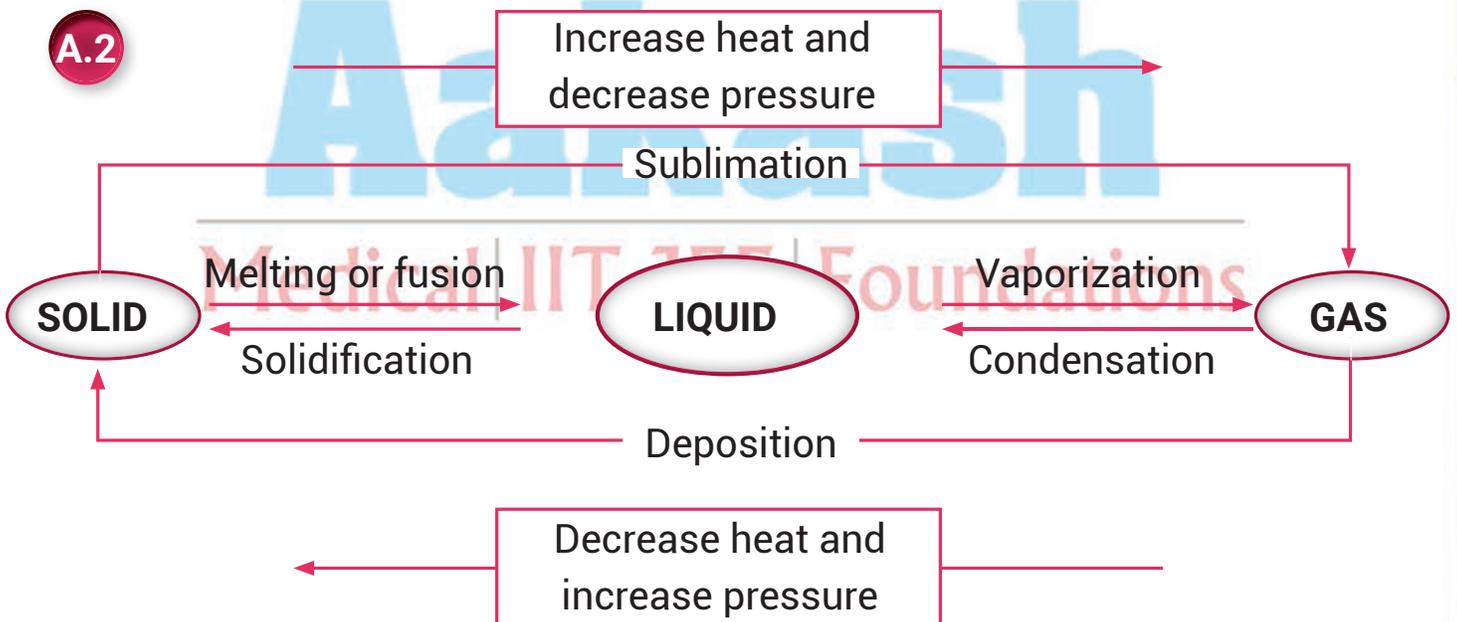
The Fundamental Unit of Life

Astounding Archetypes

PLANT CELL

Mitochondrion

Choloroplast

Vacuole

Dictyosome

Ribosome

Nucleus

Cell wall

Endoplasmic Reticulum

Cytoplasm

Cell membrane

ANIMAL CELL

Labels: Cytoplasm, Cell membrane, Centriole, Nucleus, Ribosome, Endoplasmic Reticulum, Lysosome, Mitochondrion, Golgi Apparatus, Vacuole
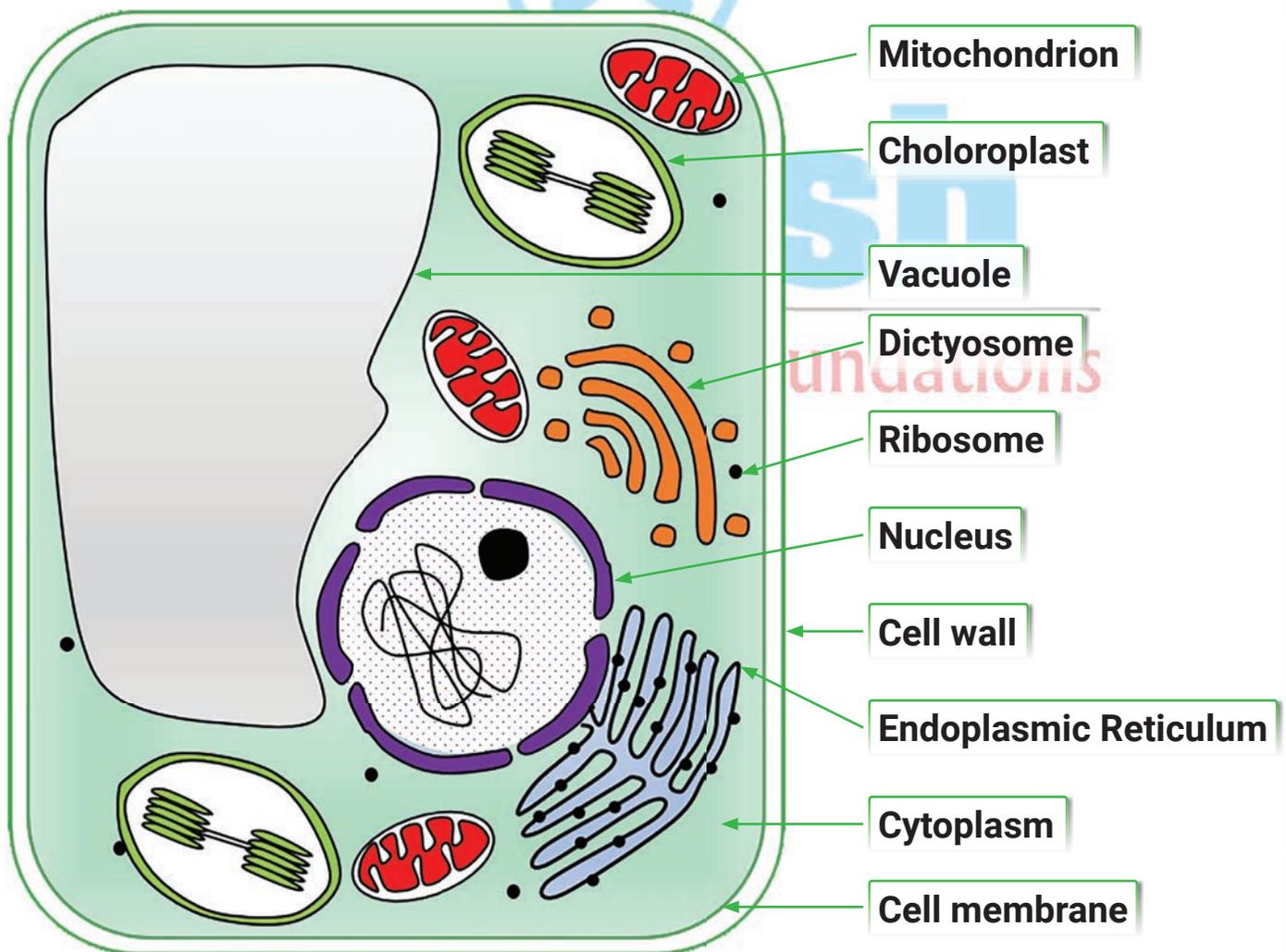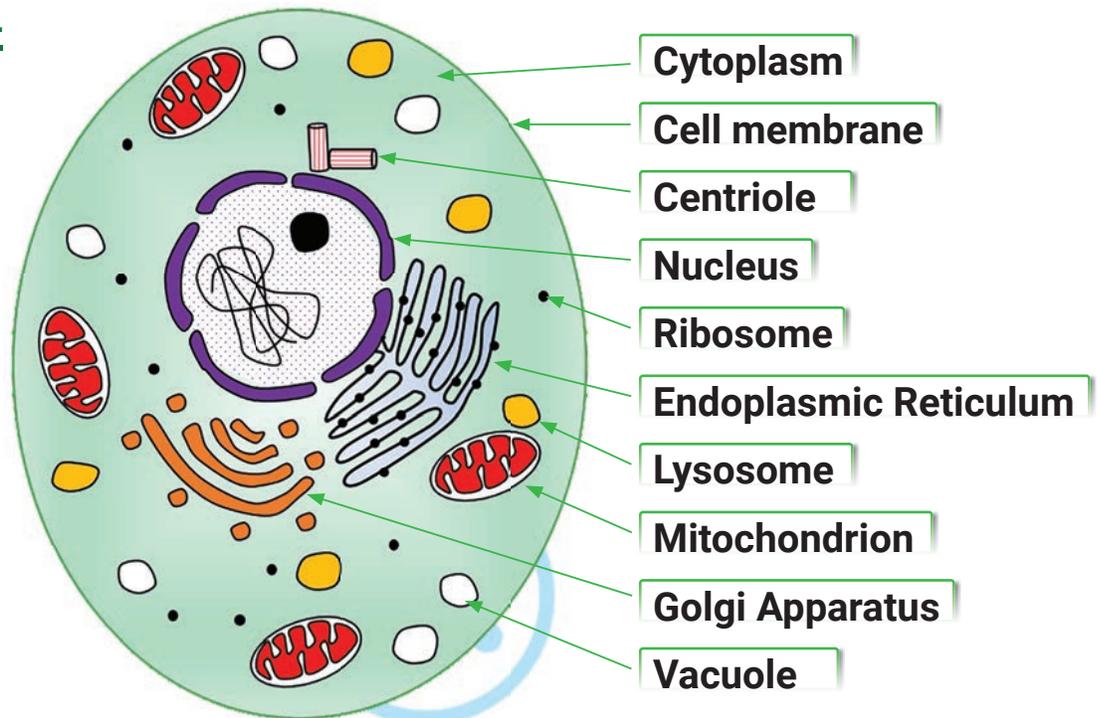
Simple Stratagems

CELL ORGANELLES

On the basis of number of membranes surrounding it

Double
- Mitochondria — **Mr.**
- Plastids — **Palash**

Single
- Endoplasmic Reticulum — **Eats**
- Golgi Apparatus — **Green**
- Lysosomes — **Leafy**
- Vacuoles — **Vegetables**

None
- Ribosomes — **Really**
- Centrosomes — **Committedly**
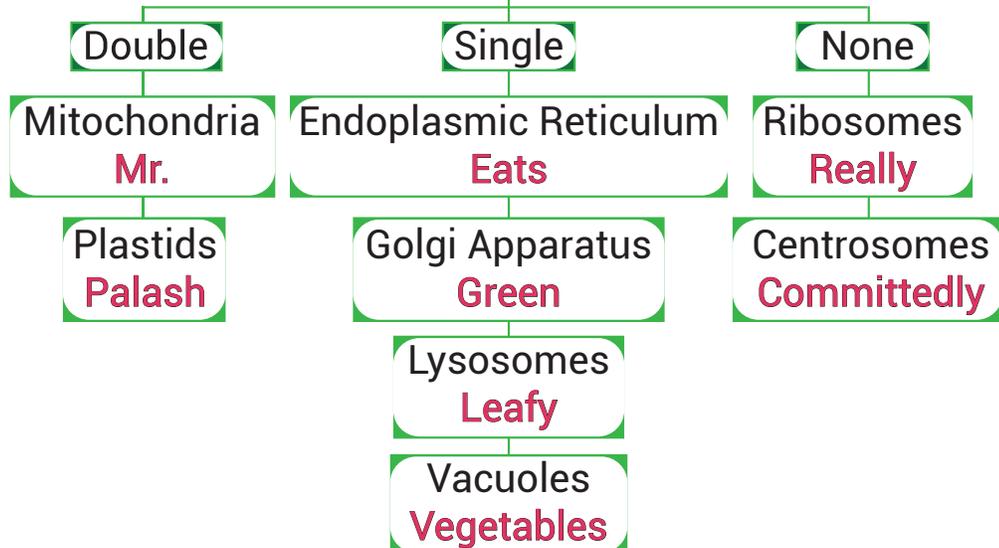
Mr. Palash Eats Green Leafy Vegetables Really Committedly

Unscramble

Unscramble the following

1. I T O M C N D H O R A I

HINT : Powerhouses of the cell

2. U C L L N E O S U

HINT : Ribosome factory

3. H L O P C O R L S A T

HINT : Kitchen of the cell

4. I B S R O O E M S

HINT : Protein factory

5. Y S L O O S M S E

HINT : Suicidal bag

6. C E N S U U L

HINT : Brain of the cell

7. D S E M M S E O S O

HINT : Connections between adjacent animal cells

8. I F U D S F O I N

HINT : Movement of gas molecules

Word Puzzle

F	P	L	G	O	L	G	I	B	O	D	Y
C	U	K	G	D	D	J	C	F	W	G	E
E	R	H	E	E	C	H	F	C	S	V	T
N	K	F	N	W	N	X	C	Z	Z	B	I
T	I	H	E	F	M	E	E	H	G	V	O
R	N	T	O	N	O	P	L	A	S	T	P
O	J	V	B	G	B	K	L	G	V	B	L
S	E	H	A	J	M	D	A	L	A	S	A
O	E	D	X	E	J	K	C	B	N	M	S
M	K	X	V	L	N	H	V	C	F	B	T
E	C	H	R	O	M	O	P	L	A	S	T
A	W	T	O	N	O	P	L	A	S	T	V

1. He coined the term 'Protoplasm'.
2. These are coloured plastids which impart colour in fruits, flowers and roots and contain pigments called carotenoids.
3. Membrane which bound sap vacuole
4. It helps in storage, modification and packaging of products in vesicles coming from ER.
5. It helps in cell division of animal cells.
6. The fundamental unit of life
7. The functional unit of DNA which is present on chromosome.
8. Chloroplast that have not been exposed to light.

Answer (Unscramble)

1. MITOCHONDRIA
2. NUCLEOLUS
3. CHLOROPLAST
4. RIBOSOMES
5. LYSOSOMES
6. NUCLEUS
7. DESMOSOMES
8. DIFFUSION

Answer (Word Puzzle)

F	P	L	G	O	L	G	I	B	O	D	Y
C	U	K	G	D	D	J	C	F	W	G	E
E	R	H	E	E	C	H	F	C	S	V	T
N	K	F	N	W	N	X	C	Z	Z	B	I
T	I	H	E	F	M	E	E	H	G	V	O
R	N	T	O	N	O	P	L	A	S	T	P
O	J	V	B	G	B	K	L	G	V	B	L
S	E	H	A	J	M	D	A	L	A	S	A
O	E	D	X	E	J	K	C	B	N	M	S
M	K	X	V	L	N	H	V	C	F	B	T
E	C	H	R	O	M	O	P	L	A	S	T
A	W	T	O	N	O	P	L	A	S	T	V

1. Purkinje
2. Chromoplast
3. Tonoplast
4. Golgi body
5. Centrosome
6. Cell
7. Gene
8. Etioplast

21

Electoral Politics

Democracy is all about the rule of the people and one of the most important aspect of it is election.

In democracy, people elect their representatives through a system of direct/indirect election. The system of election is govern by Universal Adult Franchise where all adult (at least 18+ years) are eligible for vote.

The election in India is democratic and it has the following features:

(a) Elections are held at regular interval
(b) Free and fair electoral competition
(c) Equal voting rights

In order the make the elections free and fair, the Constitution of India provides for a permanent and independent body, Election Commission of India (ECI).

Election Commission of India

Article 324 of the Indian Constitution talks about the Election Commission of India. According to it, the ECI has the power to superintendence, direct and control the election of the Parliament, State legislatures, the office of President of India and the office of Vice-President of India.

The Election Commission is an all-India body that is common to both the Central government and the State governments.

Powers of Election Commission of India

(a) Determining the electoral constituency
(b) Preparing the electoral rolls
(c) Notifying the dates of election
(d) Granting recognition to the political parties

Functions of the Election Commission of India

(a) To direct and control the election of the Parliament, State legislatures, the office of President of India and the office of Vice-President of India.
(b) To prepare electoral rolls and Electors Photo Identity Card (EPIC).
(b) To issue the Model Code of Conduct in the election for political parties and candidates so that the no one indulges in unfair practice or there is no arbitrary abuse of powers by those in power.

Composition of the Election Commission of India

(a) The Election Commission of India consists of one Chief Election Commissioner and other two Election Commissioner which are appointed by the President of India.

(b) The Chief Election Commissioner is also the Chairman of the ECI.

(c) The Chief Election Commissioner has a tenure of 6 years or 65 years (whichever is earlier).

Significance of the Election Commission of India

(a) It has a important place in maintaining the democracy in India
(b) It preserves the values of the Constitution like equality, equity, impartiality, accountability etc...
(c) It ensures the participation of all the eligible voters
(d) It creates awareness about the electoral process.
(e) It increases the trust of the people in the electoral system

1. Which article of the Indian constitution talks about the Election Commission of India?
   - (a) Article 324
   - (b) Article 352
   - (c) Article 320A
   - (d) Article 124

2. Consider the following:
   - (i) Periodic elections
   - (ii) Free and fair electoral competition

   Which of the following is not the features of the democratic election?
   - (a) I only
   - (b) II only
   - (c) Both I and II
   - (d) None of these

3. The ECI issues _____ in order to check the unfair practices or the abuse of power by the ruling party in the election.
   - (a) Election Manifesto
   - (b) Model Code of Conduct
   - (c) Yellow Card
   - (d) Symbols to the political parties

4. The tenure of the CEC is:
   - (a) 6 years or 65 years
   - (b) 5 years or 60 years
   - (c) 5 years or 65 years
   - (d) 6 years or 60 years

5. Who appoints the chairman of the Election Commission of India?
   - (a) The Lt. Governor of Delhi
   - (b) The Governor of the state
   - (c) The President
   - (d) The PM and the Council of Ministers

Answer (Quiz Time)

1. **(a)** Article 324	2. **(d)** None of these
3. **(b)** Model Code of Conduct	4. **(a)** 6 years or 65 years
5. **(c)** The President	

Adjectives

Identify the adjectives suggested from the pictures.

T ... ... y

E ... ... e

D ... ... t

E ... ... d

G c
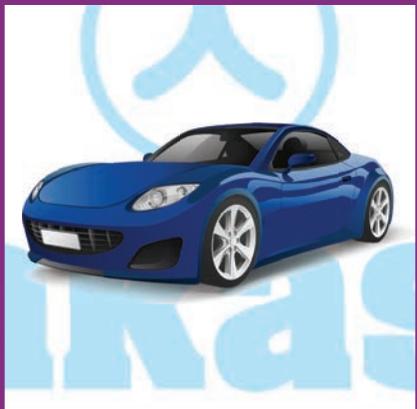
Thirsty

Expensive

Distant
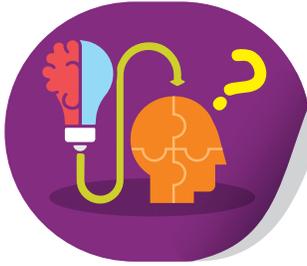
Elated

Gigantic

Seating Arrangement and Ranking Test

Q.1 Ram is fifth from the left end and Sita is ninth from the right end in a row of persons. If there are ten persons between Ram and Sita, then how many persons are there in the row ?

(a) 24   (b) 25

(c) 26   (d) 23

Q.2 Q is taller than M but smaller than P. E is taller than R but smaller than M. If they are arranged according to their height in descending order, then who will be at third position from starting ?

(a) P   (b) E

(c) M   (d) R

(Directions : Q.3 - Q.5) Read the information given below and based on it answer the following questions.

Five persons A, B, C, D, E are sitting around a circular table.

(i) All of them are facing towards the centre of the circle.

(ii) A is second to the right of C

(iii) B is third to the left of A

(iv) E is third to the right of D

Q.3 Who is fourth to the right of A ?

(a) D

(b) C

(c) B

(d) E

Q.4 Who is to the immediate left of B ?

(a) A

(b) E

(c) D

(d) C

Q.5 Who is to the immediate right of C ?

(a) A

(b) E

(c) D

(d) B

Celcius

Answer (Quiz Time)

A.1 **(a)** 24

Ram	Mid	Sita
5	10	9

$\Rightarrow$ Total = Left Rank + Right Rank + Mid Value

Total = 5 + 9 + 10

Total = 24

A.2 **(c)** M

Correct order is

P > Q > M > E > R

A.3 **(d)** E
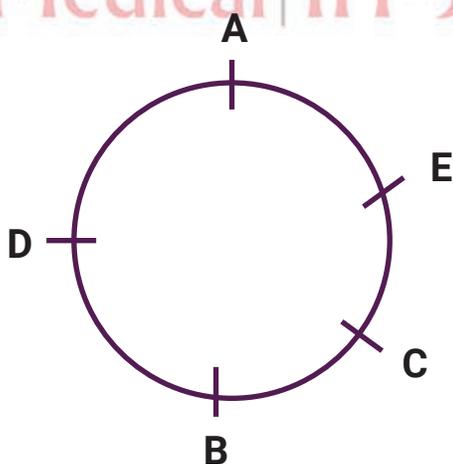
A.4 **(c)** D

A.5 **(b)** E

Stephen Hawking

> 66 *The greatest enemy of knowledge is not IGNORANCE, it is the ILLUSION of knowledge.* 99

Born - 8 Jan 1942
Died - 14 Mar 2018

Stephen Hawking was born in Oxford, England on January 8, 1942. He grew up in a highly educated family. Both of his parents had attended Oxford University and his father, Frank, was a medical researcher.

Hawking's contributions to physics earned him many exceptional honours. In 1974 the Royal Society elected him one of its youngest fellows. He became professor of gravitational physics at Cambridge in 1977, and in 1979 he was appointed to Cambridge's Lucasian professorship of mathematics, a post once held by Isaac Newton.

OUR RESULTS 2024

AIR 1

NEET (UG) 2024

State Topper					
Delhi	Uttar Pradesh	West Bengal	Uttar Pradesh	Maharashtra	Rajasthan
720/720	720/720	720/720	720/720	720/720	720/720
Mridul M Anand	Ayush Naugraiya	Arghyadeep Dutta	Aryan Yadav	Palansha Agarwal	Iram Quazi
3 Year Classroom	4 Year Classroom	2 Year Classroom	1 Year Classroom	2 Year Classroom	1 Year Classroom

JEE (Advanced) 2024

AIR 25	AIR 67	AIR 78	AIR 93	AIR 95
Rishi Shekher Shukla	Krishna Sai Shishir	Abhishek Jain	Hardik Aggarwal	Ujjwal Singh
2 Year Classroom	4 Year Classroom	4 Year Classroom	2 Year Classroom	4 Year Classroom

1430 Students Scored Above MAS

344 Classroom Students Qualified in NSEs* 2023-24

- (Group A & B) **34+30** NSEA*
- **156** NSEB*
- **72** NSEC*
- **23** NSEP*
- **29** NSEJS*

Aakashians Qualified for INO-2024

Diptanshu Sharma	Priyanshu Sarkar	Mridul Garg	Zaman Hussain	Shubhradeep Paul	Samvit Shandilya
NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP

and many more...

*NSEA-National Standard Examination in Astronomy | NSEB-National Standard Examination in Biology | NSEC-National Standard Examination in Chemistry
NSEP-National Standard Examination in Physics | NSEJS-National Standard Examination in Junior Science | INO-Indian National Olympiad

Aakashians Qualified for OCSC/IMOTC-2024

32 Classroom Students Qualified in INOs 2024

Aneesh Shastri	Sanvi Jain	Mridul M Anand	Zaman Hussain	Sushant Agarwal	Archit Kumar
Qualified INAO	Qualified INChO	Qualified INBO	Qualified INMO	Qualified INJSO	Qualified INAO Jr

and many more...

OCSCs - Orientation cum Selection Camps | IMOTC - International Mathematical Olympiad Training Camp

Aakashians Qualified for RMO from Classroom Programs

869 Classroom Students Qualified in IOQM 2024

Class VIII	Class VIII	Class VIII	Class VIII	Class VIII	Class IX
Joish Achyuta	Pranava NS	Bruteshwar Rajguru	Hardik Mishra	Hardik Dhariwal	Dhanush Damu
2 Year Classroom	3 Year Classroom	3 Year Classroom	2 Year Classroom	2 Year Classroom	4 Year Classroom

and many more...

IOQM - Indian Olympiad Qualifier in Mathematics

Board Exam Results 2024

Top Performers from Class X

Devidyuti K Pisharody	P Harini	Jiya Dugar V
Marks 500/500	Marks 499/500	Marks 498/500
CBSE	CBSE	CBSE

and many more...

Top Performers from Class XII

Ananthan R	Ansh Agrawal	Himanshu Agarwal
Marks 496/500	Marks 495/500	Marks 495/500
CBSE	CBSE	CBSE

and many more...

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