

TAMIL NADU TEACHER ELIGIBILITY TEST

Solved Original Question Paper - 2026

Duration : 3 Hours

Marks : 150

PAPER II - Maths & Science

Held on : 05.07.2026

PART - I — CHILD DEVELOPMENT AND PEDAGOGY

1. Given below are two statements :

Statement I : Theories that accept the discontinuous perspective view development as taking place in stages.

Statement II : Stages of qualitative changes in thinking, feeling and behaving that characterize specific periods of development.

In light of the above statements, choose the most appropriate answer from the options given below :

- A) Both Statement I and Statement II are correct
- B) Both Statement I and Statement II are incorrect
- C) Statement I is correct but Statement II is incorrect
- D) Statement I is incorrect but Statement II is correct

Explanation

Ans : (A)

The discontinuous perspective views development as occurring through distinct stages, with qualitative changes between stages rather than gradual growth. Stage theorists such as Jean Piaget, Erik Erikson, and Lawrence Kohlberg support this view. Each stage is characterized by qualitative changes in thinking, emotions, and behaviour, making both statements correct.

2. Match the reflexes in the List-I with their corresponding given in List-II :

List-I (Reflexes)	List-II (Functions)
a) Eye blink	1. permits feeding
b) Rooting	2. helps infant cling to mother (during evolutionary past)
c) Sucking	3. helps the infant find the nipple
d) Moro	4. protects infant from strong stimulation

In light of the above Lists choose the best-matched option from the following options :

- | | | | | |
|----|----|----|----|----|
| | a) | b) | c) | d) |
| A) | 1 | 3 | 2 | 4 |
| B) | 4 | 3 | 1 | 2 |
| C) | 1 | 2 | 4 | 3 |
| D) | 4 | 3 | 2 | 1 |

Explanation

Ans : (B)

Reflexes are involuntary responses present at birth that aid infant survival. The eye blink reflex protects against bright light and foreign objects. The rooting reflex helps locate the mother's nipple, while the sucking reflex enables feeding. The Moro (startle) reflex is believed to have evolved to help infants cling to the mother.

3. Chronologically arrange substages of Piaget's sensory motor stage.

- a) coordination of secondary circular reactions
- b) primary circular reactions
- c) reflective schemes
- d) secondary circular reactions

Choose the correct answer from the options given below :

- | | |
|-----------------------|-----------------------|
| A) (a), (b), (c), (d) | B) (b), (a), (c), (d) |
| C) (c), (b), (d), (a) | D) (d), (a), (c), (b) |

Explanation

Ans : (C)

Order:

- 1. Reflective Schemes (Reflexes) (Birth–1 month)
- 2. Primary Circular Reactions (1–4 months)
- 3. Secondary Circular Reactions (4–8 months)
- 4. Coordination of Secondary Circular Reactions (8–12 months)

Piaget divided the Sensorimotor Stage (Birth–2 years) into six substages. The first four are Reflexive Schemes, Primary Circular Reactions, Secondary Circular Reactions, and Coordination of Secondary Circular Reactions. These stages show the progression from innate reflexes to intentional, goal-directed behaviour.

4. **Assertion (A)** : Jean Piaget viewed children as discovering or constructing, virtually all knowledge about their world through their own activity.

Reason (R) : Jean Piaget's theory of cognitive development is described as a nativist approach to cognitive development.

Select the correct answer:

- A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

- B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 C) (A) is correct but (R) is not correct
 D) (A) is not correct but (R) is correct

Explanation

Ans : (C)

Piaget viewed children as active constructors of knowledge, learning through exploration, interaction, and adaptation using assimilation and accommodation. Hence, the Assertion is correct. However, Piaget's theory is primarily a constructivist theory, not a nativist approach. Nativism emphasizes innate knowledge, whereas Piaget stressed active cognitive construction.

5. **Statement I** : According to Piaget, the most fundamental deficiency of pre-operational thinking is egocentrism.

Statement II : Egocentrism is the ability to distinguish others' symbolic viewpoints from one's own.

Select the correct answer:

- A) Both Statement I and Statement II are correct
 B) Both Statement I and Statement II are incorrect
 C) Statement I is correct but Statement II is incorrect
 D) Statement I is incorrect but Statement II is correct

Explanation

Ans : (C)

According to Piaget, egocentrism is the major limitation of the Preoperational Stage (2–7 years). Children find it difficult to understand perspectives different from their own. Statement II is incorrect because it defines the opposite of egocentrism. Egocentrism refers to the inability, not the ability, to distinguish others' viewpoints.

6. **Statement I** : According to the ecological systems theory, the innermost level consists of activities and the interaction patterns in the child's inner most surroundings.

Statement II : Bronfenbrenner emphasizes that to understand child development at this level we must keep in mind that all relationships are unidirectional.

Select the correct answer:

- A) Both Statement I and Statement II are correct
 B) Both Statement I and Statement II are incorrect
 C) Statement I is correct but Statement II is incorrect
 D) Statement I is incorrect but Statement II is correct

Explanation

Ans : (C)

Bronfenbrenner's Microsystem is the innermost environmental level, including the child's immediate surroundings such as home, school, peers, and family interactions. Therefore, Statement I is correct. Statement II is incorrect because interactions within the ecological systems are bidirectional, not unidirectional. The child influences the environment, and the environment also influences the child.

7. **Arrange the individual's environments according to the levels proposed by ecological systems theory.**

- a) home, school and neighbourhood
 b) cultural values, laws and resources
 c) individual and his immediate surroundings
 d) religious institutions, parents workplace

Select the correct answer:

- A) (a), (c), (d), (b) B) (d), (c), (a), (b)
 C) (c), (a), (d), (b) D) (b), (c), (d), (a)

Explanation

Ans : (C)

Order:

1. (c) Individual and immediate surroundings → **Microsystem**
 2. (a) Home, school, neighbourhood → **Mesosystem**
 3. (d) Religious institutions, parents' workplace → **Exosystem**
 4. (b) Cultural values, laws and resources → **Macrosystem**
 Bronfenbrenner arranged environmental influences from nearest to farthest as Microsystem, Mesosystem, Exosystem, and Macrosystem. The Microsystem includes direct interactions, the Mesosystem links immediate settings, the Exosystem consists of indirect influences such as parents' workplace, and the Macrosystem represents culture, laws, and societal values.

8. **Statement I** : Erik Erikson rejects the mediating role of the ego between id impulses and super ego demands.

Statement II : Erik Erikson accepts that the ego makes a positive contribution to development, acquiring attitudes and skills at each stage that make the individual an active, contributing member of society.

Select the correct answer:

- A) Both Statement I and Statement II are correct
 B) Both Statement I and Statement II are incorrect
 C) Statement I is correct but Statement II is incorrect
 D) Statement I is incorrect and Statement II is correct

13. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R) :

Assertion (A) : A person is seeing or hearing something that is actually not there at all.

Reason (R) : An illusion is a perception that does not correspond to reality.

In the light of the above statements, choose the answer from the options given below :

- A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- C) (A) is true but (R) is false
- D) (A) is false but (R) is true

Explanation

Ans : (B)

The Assertion describes a hallucination, where a person perceives something that has no external stimulus. The Reason correctly defines an illusion as the misinterpretation of a real external stimulus. Since hallucination and illusion are different perceptual phenomena, both statements are true, but the Reason does not explain the Assertion.

14. **Assertion (A)** : Discoveries and inventions in the various fields of knowledge are the results of the trial and error process.

Reason (R) : Animals follow the path of trial and error.

Select the correct answer:

- A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C) (A) is correct but (R) is not correct
- D) (A) is not correct but (R) is correct

Explanation

Ans : (B)

E.L. Thorndike's Trial and Error Theory states that learning occurs through repeated attempts until the correct response is achieved. Animals commonly learn by this method, as demonstrated in Thorndike's puzzle-box experiments. Human discoveries and inventions may also involve trial and error, but they additionally require reasoning, insight, creativity, and scientific thinking.

15. Which among the following are laws given by Thorndike ?

- a) Law of attitude
- b) Law of similarity
- c) Law of analogy
- d) Law of associative shifting

Select the correct answer:

- A) (b), (c) and (d) only
- B) (a), (b) and (c) only
- C) (a), (b) and (d) only
- D) (a), (c) and (d) only

Explanation

Ans : (D)

Included Laws:

- Law of Attitude (Set)
- Law of Analogy (Associative Response)
- Law of Associative Shifting

Besides the primary laws (Readiness, Exercise, and Effect), Thorndike proposed several secondary laws, including Law of Attitude (Set), Law of Associative Shifting, Law of Associative Response (Analogy), Multiple Response, and Response by Analogy. Law of Similarity is not recognized as one of Thorndike's laws of learning.

16. **Statement I** : Fluid intelligence refers to accumulated knowledge that is information we store over a lifetime of experience.

Statement II : Fluid intelligence seems to decrease slowly with age.

Select the correct answer:

- A) Both Statement I and Statement II are correct
- B) Both Statement I and Statement II are incorrect
- C) Statement I is correct but Statement II is incorrect
- D) Statement I is incorrect but Statement II is correct

Explanation

Ans : (D)

According to Raymond Cattell, fluid intelligence is the ability to solve new problems using reasoning, independent of prior learning. Crystallized intelligence, not fluid intelligence, refers to accumulated knowledge and experience. Fluid intelligence generally declines gradually with age, whereas crystallized intelligence remains stable or improves.

17. Match List-I with List-II :

List-I	List-II
a) Two-factor theory	1. L.L. Thurstone
b) Group-factor theory	2. E.L. Thorndike
c) Multi-factor theory	3. Sternberg
d) Three factor theory	4. Spearman

Codes:

- | | | | |
|------|----|----|----|
| a) | b) | c) | d) |
| A) 1 | 2 | 3 | 4 |
| B) 3 | 4 | 2 | 1 |
| C) 4 | 1 | 2 | 3 |
| D) 2 | 4 | 1 | 3 |

Explanation

Ans : (C)

Spearman proposed the Two-factor Theory (g and s factors). L.L. Thurstone developed the Group Factor

Prose

6th std

1. SEA TURTLES
2. WHEN THE TREES WALKED
3. A VISITOR FROM DISTANT LANDS
4. SPORTS STARS
5. TRIP TO OOTY
6. WHO OWNS THE WATER ?
7. THAT SUNDAY MORNING
8. THE JUNGLE BOOK

7th std

1. EIDGAH
2. THE WIND ON HAUNTED HILL
3. A PRAYER TO THE TEACHER
4. ADVENTURES OF DON QUIXOTE
5. THE LAST STONE CARVER
6. JOURNEY BY TRAIN
7. A STORY OF SELF SACRIFICE
AND BRAVERY
8. JANE EYRE

8th Std

1. HOBBY – TURNS
A SUCCESSFUL CAREER
2. FRIENDSHIP

3. BEING SAFE
4. SIR ISAAC NEWTON -
THE INGENIOUS SCIENTIST
5. MY REMINISCENCE
6. THE NOSE-JEWEL
7. CYBER SAFETY
8. JACK AND THE BEANSTALK

9th std

1. LEARNING THE GAME
2. I CAN'T CLIMB TREES ANYMORE
3. OLD MAN RIVER
4. SEVENTEEN ORANGES
5. WATER – THE ELIXIR OF LIFE
6. FROM ZERO TO INFINITY
7. A BIRTHDAY LETTER

10th Std

1. HIS FIRST FLIGHT
2. THE NIGHT THE GHOST GOT IN
3. EMPOWERED WOMEN
NAVIGATING THE WORLD
4. THE ATTIC
5. TECH BLOOMERS
6. THE LAST LESSON
7. THE DYING DETECTIVE

SEA TURTLES

About the Author

SHEKAR DATTATRI writes popular articles on wildlife, conservation and film making. He has been interested in nature from childhood. He is an award-winning wildlife and conservation film maker.

Summary

SECTION - I

This lesson is about Sea Turtles which are different from Tortoise that we see in a zoo or a reptile park. There are seven species of sea turtles - out of which five are seen in India - the Olive Ridley, the Hawksbill, the Green Sea Turtle, the Loggerhead and the Leatherback. The turtles are huge and weigh between 35 kg and 700 kg. The largest sea turtle is the Leatherback which is 2.2m long and 700 kg in weight. Sea turtles come to the shore to lay their eggs. Except Olive Ridleys, other species have become rare in India. Mass Nesting or Arribada is a phenomenon that occurs in Odisha and other two places in the world where Olive Ridleys come ashore alone to lay their eggs.

SECTION - II

Between January and March, female Olive Ridleys come ashore and haul (pull with force) using their front flippers onto the beach. They choose a spot away from the high tide and dig 45 cm into which they lay their eggs. They lay about 100 eggs at a time. After covering the nest with sand it returns to the sea. The eggs are left to incubate under the sun. People collect these eggs for eating. Jackals, domestic dogs and pigs eat the eggs. After escaping from the predators, the hatchlings (little ones) come out of the egg shell with the help of egg-tooth. After they come out, they make a dash into the sea.

SECTION - III

Weighing less than 20 grams, many of these hatchlings fall prey to crabs or birds before they reach the sea. It is estimated that one in a thousand hatchlings become an adult. After swimming for years in the sea, the adult female returns to the same beach where they were born which is an unsolved mystery. Human activities have endangered the survival of sea turtles. Problems like pollution, dumping of plastics into the ocean and the construction activities on nesting beaches endanger their survival. We have to tackle these problems to save the sea turtles.

? DO YOU KNOW

There is an interesting aspect of sea turtle biology. The temperature inside the egg determines the sex of the embryo while it is growing. When the eggs develop at 27°C - 28°C only male hatchlings are produced. At 30°C, only female hatchlings are produced. An equal mix of male and female hatchlings is produced only when the eggs incubate at precisely 29°C - 30°C

I. Select the suitable synonyms

- entire**
A) small B) partial
C) whole
- huge**
A) large B) little
C) dwarfed
- connection**
A) separation B) link
C) division
- extremely**
A) majorly B) initially
C) slowly
- commonly**
A) individually B) usually
C) urgently

Ans : (C)

Ans : (A)

Ans : (B)

Ans : (A)

Ans : (B)

- haul**
A) pull force B) push force
C) twist force
- slash**
A) join B) cut
C) merge
- emerge**
A) disperse B) submerge
C) come out
- camouflage**
A) seek B) colour
C) hide
- scent**
A) stink B) perfume
C) heat

Ans : (A)

Ans : (B)

Ans : (C)

Ans : (C)

Ans : (B)

11. aspect A) characteristic B) respect C) perfect	Ans : (A)	6. tiny A) big B) small C) little	Ans : (A)
12. prey A) winner B) victim C) survivor	Ans : (B)	7. predators A) hunters B) killers C) rescuers	Ans : (C)
13. tiny A) large B) huge C) small	Ans : (C)	8. cavity A) crater B) bulge C) dent	Ans : (B)
14. estimate A) calculate B) exact C) appropriate	Ans : (A)	9. camouflage A) expose B) mask C) cover	Ans : (A)
15. adult A) young B) pre-mature C) matured	Ans : (C)	10. scent A) aroma B) fragrance C) stink	Ans : (C)
16. survive A) die B) exist C) kill	Ans : (B)	11. emerge A) arise B) submerge C) appear	Ans : (B)
17. fascinating A) interesting B) surprising C) enjoying	Ans : (A)	12. haul A) push B) lift C) pull	Ans : (A)
18. mystery A) interesting B) story C) puzzle	Ans : (C)	13. natural A) normal B) common C) artificial	Ans : (C)
19. wonderful A) amazing B) ordinary C) casual	Ans : (A)	14. accidentally A) unintentionally B) deliberately C) unwittingly	Ans : (B)
20. accidentally A) wantedly B) deliberately C) unintentionally	Ans : (C)	15. sadly A) happily B) gloomily C) cheerlessly	Ans : (A)
22. construction A) destruction B) creation C) confusion	Ans : (B)	16. interested A) keen B) concerned C) uninterested	Ans : (C)
II. Select the suitable antonyms		17. conservation A) preservation B) depletion C) control	Ans : (B)
1. entire A) absolute B) integral C) partial	Ans : (C)	18. famous A) infamous B) acclaimed C) eminent	Ans : (A)
2. largest A) biggest B) smallest C) tallest	Ans : (B)	19. estimate A) guess B) appraise C) exact	Ans : (C)
3. commonly A) rarely B) frequently C) regularly	Ans : (A)	20. own A) possess B) rent C) dominate	Ans : (B)
4. after A) later B) next C) before	Ans : (C)	21. adult A) juvenile B) grown-up C) mature	Ans : (A)
5. life A) soul B) death C) spirit	Ans : (B)		

WHEN THE TREES WALKED

PROSE

About the Author

RUSKIN BOND is an award winning Indian author of more than 500 books, short stories, essays and novels. He writes poetry and books for children as well as adults. He lives with his adopted family in Landour, in Mussoorie, India. He was awarded the Padma Shri in 1999 and Padma Bhushan in 2014.

Summary

SECTION - I

The story starts with the narrator and his Grandfather sitting on the veranda steps when the narrator notices a tendril (a climbing plant) creeping towards the Grandfather. After twenty minutes the tendril crosses the step and touches Grandfather's feet.

The narrator believes there is a scientific explanation to the plant's behaviour. Whenever Grandfather joined the narrator in the garden, the garden became a happy place. The Grandfather served many years in the Indian Forest Service. So he liked trees and plants. After his retirement he built a bungalow on the outer area of Dehradun. He planted trees like lime, mango, orange and guava around the house. The Doon valley was fertile, so all the trees grew tall and strong.

An old peepal tree broke through the walls of an abandoned outhouse. Peepal trees have broad-chested trunk and slim-waisted leaves that spin like tops which attract our attention and invites us into their shade. Grandmother wanted to cut down the peepal tree but Grandfather decided not to as he thought he could build another outhouse.

Grandmother was not against trees but fond of growing flowers. She ordered seeds and Grandfather helped her out in gardening. Grandfather helped her not because he liked flower garden but he liked watching butterflies attracted towards the flowers.

SECTION - II

Grandfather, during the rains, would walk into the jungle beyond the river-bed with saplings and cuttings, which he would plant in the forest. The Narrator questioned Grandfather that no one would come there. Grandfather replied that he was planting them for the forest and for the animals and birds for more food and shelter. He also explained that trees are required to keep the desert away, to attract rain, to prevent the banks of rivers from being washed away and for fruits and flowers.

The Narrator helped Grandfather with enthusiasm while Grandfather taught the narrator a George Morris poem. Grandfather said trees would start to walk again like they did earlier until some busybody (a mischief) cast a spell on them.

The narrator and Grandfather saw an island that was dry in summer but flooded during rains. Grandfather saw a small mango tree growing there and decided to plant tamarind, laburnum and coral tree saplings on the island.

SECTION - III

The narrator spent the monsoon season with his Grandparents, where he saw life and greenness brought in by the rains. He also saw broad-leaved vines, peepal trees taking root in the ceiling, a mango sprout on the window-sill. During Second World War, the narrator went to live with his father in Delhi. After two or three years he left for England and returned to India after several years. When he returned to Dehradun after many years, he walked towards the river bed. He was surprised to see the spectacular (amazing) view of the island where they had planted coral tree saplings. He could hear squirrels and koel asking him who he was ?. The narrator could see that the trees recognized him and came nearer. He thought of what his Grandfather had said, "Trees are walking again".



DO YOU KNOW

- ♦ India has more than 17000 species of flowering plants. Tamil Nadu with more than 5000 species - nearly 1/3rd of the total flora of India - probably has the highest diversity in India.
- ♦ The Western Ghats is home to nearly 325 globally - threatened flora and fauna.

I. Select the suitable synonyms :

1. beside

- A) above
C) below

B) next to

Ans : (B)

2. creeping

- A) crawling
C) moving

B) summing

Ans : (A)

3. beneath

- A) above
C) front

B) under

Ans : (B)

4. fertile

- A) barren
C) productive

B) worthy

Ans : (C)

MATHEMATICS

- * Numbers
- * Measurements
- * Algebra
- * Ratio and Proportion
- * Geometry
- * Statistics
- * Bills, Profit & Loss
- * Fractions
- * Integers
- * Symmetry
- * Percentage and Simple Interest
- * Perimeter and Area
- * Information Processing
- * Life Mathematics
- * Set Language
- * Trigonometry
- * Mensuration
- * Probability
- * Relations and Functions

NUMBERS

IMPORTANT POINTS

- When 1 is added to a number we get its **Successor**.
- When 1 is subtracted from a number we get its **Predecessor**.

Indian Number System			International Number System		
Period	Name	Numerals	Period	Name	Numerals
Ones	One	1	Ones	One	1
	Ten	10		Ten	10
	Hundred	100		Hundred	100
Thousands	Thousand	1000	Thousands	Thousand	1000
	Ten Thousand	10,000		Ten Thousand	10,000
Lakhs	Lakh	1,00,000		Hundred Thousand	100,000
	Ten Lakh	10,00,000	Millions	Million	1,000,000
Crores	Crore	1,00,00,000		Ten Million	10,000,000
	Ten Crore	10,00,00,000		Hundred Million	100,000,000
	Hundred Crore	100,00,00,000	Billions	Billion	1,000,000,000
	Thousand Crore	1000,00,00,000		Ten Billion	10,000,000,000

- The number 10100 is called **googol** (This is, 10 multiplied 100 times)
- The number 10googol = $10^{(10^{100})}$ is called **googolplex**.

Thomas Harriot (1560 - 1621)

- A famous mathematician was the first to use "<" (less than) and ">" (greater than) symbols.

Expansion of BIDMAS

- The collection of {1, 2, 3, ...} is called **Natural numbers** denoted by N.

• B -	Bracket
• I -	Indices
• D -	Division
• M -	Multiplication
• A -	Addition
• S -	Subtraction

- The collection of {0, 1, 2, 3, ...} is called **Whole numbers**, denoted by W.
- The smallest natural number is 1.
- The smallest whole number is 0.

- When two numbers are added or multiplied, the order of the numbers does not affect the sum or the product. This is called **Commutativity of addition or multiplication**.

Example

$$43 + 57 = 57 + 43 \quad ; \quad 12 \times 15 = 15 \times 12$$

- Subtraction and division are not Commutative.

Example

$$7 - 3 \neq 3 - 7 \quad ; \quad 12 \div 6 \neq 6 \div 12$$

- When several numbers are added, the order in which the numbers are added does not matter. This is called "**Associativity of addition**".

Example

$$(43+57) + 25 = 43 + (57+25)$$

- When several numbers are to be multiplied, the order in which the numbers are multiplied does not matter. This is called "**Associativity of multiplication**".

Example

$$12 \times (15 \times 17) = (12 \times 15) \times 17$$

☛ Subtraction and division are **NOT associative**.

- Natural Number + Natural Number = Natural number
- Natural Number $\times$ Natural Number = Natural number
- Whole Number + Whole Number = Whole Number
- Whole Number $\times$ Whole Number = Whole Number
- Whole Number + Natural Number = Natural Number
- Whole Number $\times$ Natural Number = Whole Number

☛ When zero is added to any number, we get the same number. Hence zero is called the "**Additive identity**".

☛ Similarly, When we multiply any number by 1, we get the same number. Hence 1 is called the "**Multiplicative identity**".

- Any number multiplied by zero gives zero.
- Division by zero is not defined. It is indeterminant.
- Estimation is approximating a quantity to a reasonable accuracy.

☛ A natural number greater than 1, having only two factors namely 1 and the number itself, is called a '**Prime Number**'.

☛ (e.g.) $13 = 1 \times 13$; $7 = 1 \times 7$

☛ A natural number having more than two factors is called a '**Composite Number**'.

☛ (e.g.) $30 = 1 \times 2 \times 3 \times 5$

☛ A Pair of prime numbers whose difference is 2; it is called as '**Twin Primes**'.

☛ (e.g.) (5, 7) and (17, 19)

☛ Every composite number can be expressed as a product of prime numbers in a '**Unique Way**'.

☛ The sum of any two odd numbers is always **even number**.

Sieve of Eratosthenes Method:

This method is a simple method of elimination by which we can easily find the prime numbers upto a given number. This method given by a Greek Mathematician, Eratosthenes of Alexandria.

☛ The sum of an odd number and an even number is always an **odd number**

☛ The product of any two odd numbers is always an **odd number**.

☛ The product of an odd and an even number is always an **even number**.

☛ The product of three odd numbers is always an **odd number**.

☛ 1 is the first odd **natural number**

☛ 0 is the first even **whole number**

☛ **Divisibility by 2**

A number is divisible by 2, if its ones place is any one of the even numbers 0, 2, 4, 6 or 8.

☛ **Divisibility by 3**

A number is divisible by 3, if the sum of its digits

is divisible by 3.

☛ **Divisibility by 4**

A number is divisible by 4, if the last two digits of the given number is divisible by 4. If the last two digits of a numbers are zeros, then also it is divisible by 4.

☛ **Divisibility by 5**

A number is divisible by 5, if its ones place is either 0 or 5.

☛ **Divisibility by 6**

A number is divisible by 6, if it is divisible by both 2 and 3.

☛ **Divisibility by 7**

Though a rule for divisibility of a number by 7 exists, it is a bit tricky and dividing directly by 7 will be easier.

☛ **Divisibility by 8**

A number is divisible by 8, if the last three digits of the given number is divisible by 8. If the last three digits of a number are zeros, then also it is divisible by 8.

Since multiplication Satisfies commutativity the order of the factors in the product does not affect the value of the number.

☛ **Divisibility by 9**

A number is divisible by 9, if the sum of its digits is divisible by 9. The numbers divisible by 9 are also divisible by 3.

☛ **Divisibility by 10**

A number is divisible by 10, if its ones place is only zero. The numbers divisible by 10 are also divisible by 5.

☛ **Divisibility by 11**

A number is divisible by 11, if the difference between the sum of alternative digits of the number is either 0 or divisible by 11.

Example 256795.

Here, the difference between the sum of alternative digits = $(2 + 6 + 9) - (5 + 7 + 5) = 17 - 17 = 0$

☛ **Perfect number:**

A number is a **Perfect Number** if the sum of its factors other than the given number gives the same number.

Example : 6 is a perfect number, since adding the factors of 6 (other than 6) namely 1, 2 and 3 gives the given number 6.

i.e., $1 + 2 + 3 = 6$ is the given number.

☛ The total number of primes upto 100 is 25.

☛ The only prime number that ends with 5 is 5.

☛ 1 is neither prime nor composite.

☛ The Highest Common Factor (**HCF**) is also called as the Greatest Common Divisor (**GCD**) or the Greatest Common Factor (**GCF**).

All the prime numbers, except 2 and 3 can be expressed as 1 more or 1 less to a multiple of 6.

example: $37 = (6 \times 6) + 1$

$$11 = (6 \times 2) - 1$$

$$13 = (6 \times 2) + 1$$

$$17 = (6 \times 3) - 1$$

$$19 = (6 \times 3) + 1$$

- ➡ The Highest Common Factor of any two non-zero whole numbers is the largest common factor of both the numbers.
- ➡ The Least Common Multiple of any two non-zero whole numbers is the smallest common multiple of both the numbers.
- ➡ Two numbers having 1 as their only common factor are said to be **Co-Primes** or **Relatively Prime**.
- ➡ The product of two given numbers is equal to the product of their HCF and LCM.

Problems

1. The predecessor of the smallest 5 digit number is

Solution :

$$\text{The predecessor} = 10,000 - 1 = 9999$$

2. How many hundreds are there in 10 lakh ?

Solution :

$$\frac{10,00,000}{100} = 10,000$$

$$10 \text{ lakh} = 10,000 \text{ Hundreds}$$

3. How many ten thousands are there in the smallest 6 digit number ?

Solution :

$$\frac{\text{One lakh}}{\text{Ten thousand}} = \frac{1,00,000}{10,000} = 10$$

$$1 \text{ lakh} = 10 \text{ Ten thousands}$$

4. Using the digits 5, 2, 0, 7, 3 form the largest 5 digit number and the smallest 5 digit number

Solution :

$$\text{Largest number} = 75320$$

$$\text{Smallest number} = 20357$$

(Reverse order of 75320 is 02357. But as it becomes a four digit number 2357, we have to take 20357 as the smallest number.

5. Rajan writes a 3-digit number using the digits 4, 7 and 9. What are the possible numbers that he can write ?

Solution :

Rajan can write 6 numbers.

$$479, 497, 794, 749, 974, 947$$

6. The password to access my ATM card includes the digits 9, 4, 6 and 8. It is the smallest 4 digit even number. Find the password of my ATM card.

Solution :

Given digits are 9, 4, 6 and 8

Smallest number with these digits is 4689

Given that it is an even number.

∴ It may be 4698

So password of ATM card is 4698.

7. Simplify : $24 + 2 \times 8 \div 2 - 1$

Solution :

$$24 + 2 \times 8 \div 2 - 1 \text{ (Given question)}$$

$$\begin{aligned} &\Rightarrow 24 + 2 \times 4 - 1 \text{ (} \div \text{ operation completed first)} \\ &\Rightarrow 24 + 8 - 1 \text{ (} \times \text{ operation completed second)} \\ &\Rightarrow 32 - 1 \text{ (} + \text{ operation completed third)} \\ &\Rightarrow 31 \text{ (} - \text{ operation completed fourth)} \end{aligned}$$

8. Simplify : $20 + [8 \times 2 + \{6 \times 3 - 10 \div 5\}]$

Solution :

$$\begin{aligned} &\Rightarrow 20 + [8 \times 2 + \{18 - 10 \div 5\}] \text{ (bar completed first)} \\ &\Rightarrow 20 + [8 \times 2 + \{18 - 2\}] \text{ (} \div \text{ completed second)} \\ &\Rightarrow 20 + [8 \times 2 + 16] \text{ (} \{ \} \text{ completed third)} \\ &\Rightarrow 20 + [16 + 16] \text{ (} \times \text{ completed fourth)} \\ &\Rightarrow 20 + 32 \text{ (} [] \text{ operation completed fifth)} \\ &= 52 \text{ (+ completed last)} \end{aligned}$$

9. Simplify : $(10 + 17) \div 3$

Solution :

$$(10 + 17) \div 3 \Rightarrow 27 \div 3 = 9$$

10. Simplify : $12 - [3 - \{6 - (5 - 1)\}]$

Solution :

$$\begin{aligned} &\Rightarrow 12 - [3 - \{6 - 4\}] \\ &\Rightarrow 12 - [3 - 2] \Rightarrow 12 - 1 = 11 \end{aligned}$$

11. Simplify : $100 + 8 \div 2 + \{(3 \times 2) - 6 \div 2\}$

Solution :

$$\begin{aligned} &\Rightarrow 100 + 8 \div 2 + \{6 - 6 \div 2\} \\ &\Rightarrow 100 + 8 \div 2 + \{6 - 3\} \\ &\Rightarrow 100 + 8 \div 2 + 3 \\ &\Rightarrow 100 + 4 + 3 = 107 \end{aligned}$$

12. If the cost of a copy of a Thirukkural book is ₹188, then find the estimated cost of 31 copies of such book. (Note : Find the rounded values of 188 and 31 and then find the result)

Solution :

188 is nearer to 200 and 31 is nearer to 30.

The estimated cost of 31 copies

$$= 200 \times 30 = ₹ 6000$$

13. Find the estimated value of $5598 \div 689$.

Solution :

5600 is nearest to 5598.

700 is nearest to 689.

$$5600 \div 700 = 8$$

Hence, the estimated value is 8.

GENERAL SCIENCE

PHYSICS

- ☀ Measurements
- ☀ Force and Motion
- ☀ Laws of Motion
- ☀ Heat and Temperature
- ☀ Electricity
- ☀ Magnetism and Electromagnetism
- ☀ Light
- ☀ Forces and Pressure
- ☀ Optics
- ☀ Sound
- ☀ Acoustics
- ☀ Fluids
- ☀ Thermal Physics
- ☀ Nuclear Physics
- ☀ Nature of Universe and Space Science

MEASUREMENTS

Introduction

Measurement is the act of determining an object's size, length, weight, capacity or other features. It is the basis of all important scientific studies. Measurement can also be stated as the determination of the size or magnitude of a quantity and it is considered as a cornerstone of trade, science, technology and quantitative research in various disciplines.

Physical Quantities

Physical quantity can be classified into two types: **fundamental quantities** and **derived quantities**.

Quantities which cannot be expressed in terms of any other physical quantities are called fundamental quantities. Example: Length, mass, time, temperature, etc. Quantities which are calculated from two or more measurements are called derived quantities. Example : area, volume and density etc. Physical quantities have a numerical value (a number) and a unit of measurement.

Units

- ♦ A unit is the standard quantity with which unknown quantities are compared. It is defined as a specific magnitude of a physical quantity that has been adopted by law or convention. For example, feet is the unit for measuring length. That means, 10 feet is equal to 10 times the definite predetermined length, called feet.
- ♦ In earlier time, different unit systems were used by people in different countries. They are :

Unit systems of early period :

System	Length	Mass	Time
CGS	centimetre	gram	second
FPS	foot	pound	second
MKS	metre	kilogram	second

But, at the end of the Second World War there was a necessity to use worldwide system of measurement. Hence, SI (International System of Units) system of units was developed and recommended by General Conference on Weights and Measures in 1960 for international usage.

SI System of Units

- ♦ SI system of units is the modernised and improved form of the previous system of units. It is accepted in almost all the countries of the world. It is based on a certain set of fundamental units from which derived units are obtained by multiplication or division. There are seven fundamental units in the SI system of units.
- ♦ The units used to measure the fundamental quantities are called fundamental units and the units which are used to measure derived quantities are called derived units.

Fundamental physical quantities and their units

Fundamental Quantities	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Temperature	kelvin	K
Electric current	ampere	A
Luminous intensity	candela	cd
Amount of substance	mole	mol

Derived quantities and their units

Physical quantity	Expression	Unit
Area	length $\times$ breadth	m ²
Volume	area $\times$ height	m ³
Density	mass / volume	kgm ⁻³
Velocity	displacement/time	ms ⁻¹
Momentum	mass $\times$ velocity	kgms ⁻¹
Acceleration	velocity / time	ms ⁻²
Force	mass $\times$ acceleration	kgms ⁻² or N
Pressure	force / area	Nm ⁻² or Pa
Energy (work)	force $\times$ distance	Nm or J
Surface tension	force / length	Nm ⁻¹

Fundamental Units

Length

- ♦ Length is defined as the distance between two points. The SI unit of length is metre. One metre is the distance travelled by light through vacuum in $1/29,97,92,458$ second.
- ♦ In order to measure very large distance (distance of astronomical objects) the following units are used : **Light year, Astronomical unit, Parsec.**

- Light travels 3×10^8 m in one second or 3 lakhs kilometre in one second. The total number of seconds in one year is equal to $365 \times 24 \times 60 \times 60 = 3.153 \times 10^7$ second.
1 light year = $(3.153 \times 10^7) \times (3 \times 10^8) = 9.46 \times 10^{15}$ m.
- The nearest star alpha centauri is about 1.34 parsec from the sun. Most of the stars visible to the unaided eye in the night sky are within 500 parsec distance from the sun.

Light year

It is the distance travelled by light in one year in vacuum and it is equal to 9.46×10^{15} m.

GENERAL SCIENCE

CHEMISTRY

- ☀ *Matter Around Us*
- ☀ *Air and Water*
- ☀ *Changes Around Us*
- ☀ *Acids, Bases and Salts*
- ☀ *Carbon and its Compounds*
- ☀ *Chemistry in Everyday Life*
- ☀ *Atomic Structure*
- ☀ *Atoms and Molecules*
- ☀ *Periodic Classification of Elements*
- ☀ *Solutions*
- ☀ *Chemical Reactions*
- ☀ *Polymer Chemistry*
- ☀ *Chemical Bonding*
- ☀ *Applied Chemistry*
- ☀ *Basic Concepts of Chemistry and Chemical Calculations*

MATTER AROUND US

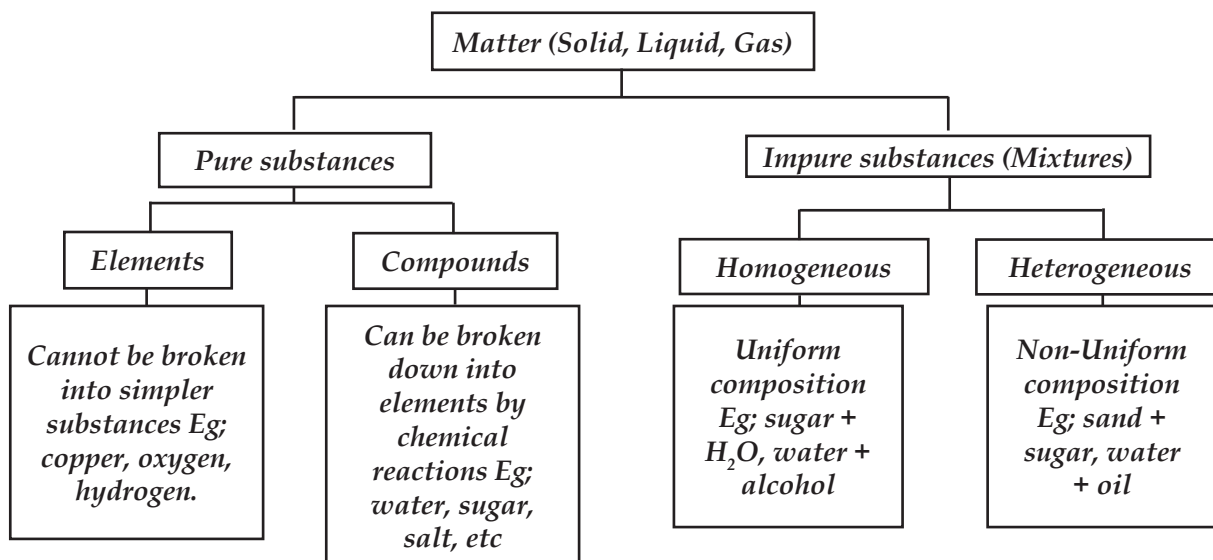
Introduction

- ◆ In science, the term 'matter' is used for all the substances and materials from which the universe is composed. '**Matter is anything that has mass and takes up space**'. At a minimum, matter required at least one subatomic particle, although most matter consists of atoms.
- ◆ In other words, matter is a collection of particles that constitutes a body. It has mass, volume, weight and density. Substances exist in three different states of matter, known as solid, liquid and gas. (There is fourth state of matter called plasma. In this state matter exists as ionised gas. This occurs at very high temperature.
- ◆ For example, matter in the sun is in the plasma state.

Classification of matter :

- ◆ Matter can also be classified on the basis of chemical composition other than basis of their physical states. In broader sense, matter can be classified into **pure substances and mixtures**.
- ◆ In chemistry, pure substances are those which contain only one kind of particles whereas, impure substances (mixtures) contain more than one kind of particles. As we look around, we can see that most of the matter around us exist as mixtures of two or more pure components. **Example** : Sea water, minerals, soil, etc.

Not all things that we see or feel are matter. For example, sunlight, sound, force and energy neither occupy space nor have any mass. These are not matter.



Atom : The smallest unit of an element which may or may not have an independent existence, but always takes part in a chemical reaction.

Molecules : The smallest unit of a pure substance, which always exists independently and can retain physical and chemical properties of that substance.

Examples : Hydrogen molecule consists of two atoms of hydrogen (H_2), Oxygen molecule consists of two atoms of oxygen (O_2)

Atom

- ◆ An atom is the smallest particle of an element, which exhibits all the properties of that element. It may or may not exist independently but takes part in every chemical reaction.

Molecules

Atoms of the same element or different elements combine to form a molecule. A molecule is the smallest particle of a pure substance (element or compound), which can exist independently and retain the physical and chemical properties of the substance.

Ions

Atoms or group of atoms having a charge (positive or negative) are called ions.

Symbols

A symbol is an image, object, etc., that stands for some meaning. In chemistry each element is denoted by a symbol. Writing out the name of an element every time would become too troublesome. So, the name of an element is represented by shortened form called as symbol.

GENERAL SCIENCE

BIOLOGY

- | | |
|--------------------------------------|--|
| ☀ The World of Plants | ☀ Transportation in Plants |
| ☀ The World of Animals | ☀ and Circulation in Animals |
| ☀ Health and Hygiene | ☀ Organ Systems |
| ☀ Cell Biology | ☀ Nervous System |
| ☀ Plant Kingdom | ☀ Plant and Animal Hormones |
| ☀ Plant Anatomy and Plant Physiology | ☀ Heredity |
| ☀ World of Microbes | ☀ Breeding and Biotechnology |
| ☀ Animal Kingdom | ☀ Nutrition and Health |
| ☀ Origin and Evolution of Life | ☀ Nutrition and Health - II |
| ☀ Basis of Classification | ☀ Economic Biology |
| ☀ Organization of Tissues | ☀ Evolution |
| ☀ Movements | ☀ Crop Production and Management |
| ☀ Reproduction in Plants and Animals | ☀ Environmental Science and Environmental Management |
| ☀ Reaching the Age of Adolescence | ☀ Applications of Biotechnology |
| ☀ Structural Organisation of Animals | |

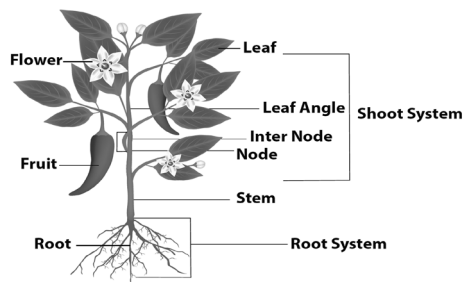
THE WORLD OF PLANTS

Introduction

The living world comprises of plants and animals. Plants can prepare food itself, grow in size, and reproduce. Various parts of the plants are used as food, medicine, wood, and shelter.

Plant forms and functions:

- ◆ Plants are of many forms and many colours, yet they are alike in some manner.
- ◆ Flowering plant consists of two main parts. They are,
 1. Root system.
 2. Shoot system



Root system

1. Tap root system.
2. Fibrous root system

Tap root system

It consists of a single root, called taproot, which grows straight down into the ground. Smaller roots, called lateral roots arise from the taproot. They are seen in dicotyledonous plants. Example : Bean, Mango, Neem.

Fibrous root system

- ◆ It consists of a cluster of roots arising from the base of the stem. They are thin and uniform in size.
- ◆ It is generally seen in monocotyledonous plants. Example: Grass, Paddy, Maize.

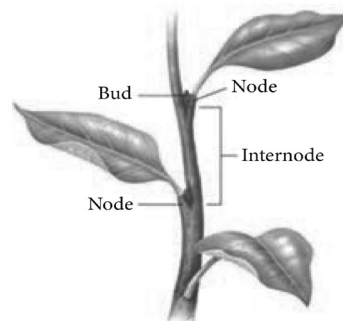
Functions of the Root

- ◆ Fixes the plant to the soil.
- ◆ Absorbs water and minerals from the soil.
- ◆ Stores food in some plants like Carrot and beet root.

Shoot System

Stem

The aerial part of the plant body above the ground is known as the shoot system. Main axis of the shoot system is called the stem. The shoot system consists of stem, leaves, flowers and fruits. Stem grows above the soil, and it grows towards the sunlight. It has nodes and internodes. Nodes are the parts of stem, where leaf arises. The part of the stem between two successive nodes is called internode. The bud at the tip of the stem is known as apical or terminal bud, and the buds at the axils of the leaves are called auxiliary buds.



Functions of the stem

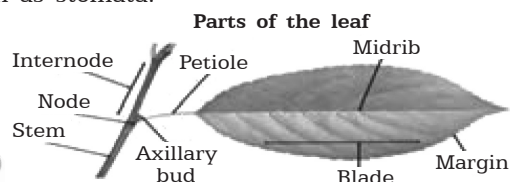
- ◆ It supports the branches, leaves, flowers and fruits.
- ◆ It transports water and minerals from roots to upper aerial plant parts.
- ◆ It transports the prepared food from leaves to other parts through stem.
- ◆ It stores food as in the case of sugarcane.

Structure of a leaf

The leaf is a green, flat expanded structure borne on the stem at the node.

A leaf has a stalk called petiole. The flat portion of the leaf is called leaf lamina or leaf blade. On the lamina, there is a main vein called midrib. Other veins are branch out from mid rib. The portion of the leaf connected in the nodal region of the stem is known as the leaf base. Leaves of some plants possess a pair of lateral outgrowth on the base, on either side of auxiliary bud. These are called stipules.

The green colour of the leaf is due to the presence of green coloured pigment called chlorophyll. On the lower side of the leaf there are tiny pores or openings known as stomata.



Functions of the leaf

- ◆ It prepare food by the process of photosynthesis.
- ◆ It helps in respiration.
- ◆ It carry out transpiration.

Victoria amazonica, the leaves of this plant grow up to 3 metres across. A mature Victoria leaf can support an evenly distributed Load of 45 Kilograms or apparently young person.

Habitat

Each and every organism needs a place to live and reproduce. Such a dwelling place is called habitat. From the depths of the ocean to the top of the highest mountain, habitats are places where plants and animals live.