



MARCH-2023 (AP)

PREVIOUS PAPERS

IPE: MARCH-2023(AP)

Time : 3 Hours

JR.BOTANY

Max.Marks : 60

SECTION-A**I. Answer ALL the following VSAQ:****10 × 2 = 20**

1. Why is Mendel considered as the father of Genetics?
2. Differentiate between apocarpous and syncarpous ovary.
3. Define the terms 'couplet' and 'lead' in taxonomic key.
4. How are 'Viroids' different from 'Viruses'?
5. What is "Omega Taxonomy"?
6. Differentiate actinomorphic from zygomorphic flower.
7. What is referred to as satellite chromosome?
8. Hydrophytes show reduced xylem. Why?
9. Explain the Zwitterionic form of an amino acid.
10. An anther has 1200 pollen grains. How many pollen mother cells must have been there to produce them?

SECTION-B**II. Answer any SIX of the following SAQs:****6 × 4 = 24**

11. List the changes observed in angiosperm flower subsequent to pollination and fertilisation.
12. Differentiate between red algae and brown algae.
13. Give a brief account of Dinoflagellates.
14. What are the characteristics of prokaryotic cell?
15. What is the difference between lenticels and stomata?
16. Give economic importance of plants belonging to Fabaceae.
17. Though redundantly described as a resting phase, interphase does not really involve rest. Comment.
18. List out the anatomical adaptations of hydrophytes.

SECTION-C**III. Answer any TWO of the following LAQs:****2 × 8 = 16**

19. Describe the internal structure of a Dicot Root.
20. With a neat, labelled diagram, describe the parts of a mature angiosperm embryo sac. Mention the role of synergids.
21. Explain how stem is modified variously to perform different functions.

IPE AP MARCH-2023

ANSWERS

SECTION-A

1. Why is Mendel considered as the father of Genetics? [TS M-17]

- A. 1) **Mendel** conducted hybridisation experiments on pea plants and also introduced the laws of inheritance in 1866.
- 2) After this a considerable progress was seen in Botany. So, he is declared as **Father of Genetics**.

2. Differentiate between apocarpous and syncarpous ovary. [AP M-23]

A:	Apocarpous Ovary	Syncarpous Ovary
	1) All the carpels of gynoecium present on the thalamus are free from each other	1) All the carpels of gynoecium present on the thalamus are fused with each other.
	2) Ex: Lotus, Rose.	2) Ex: Mustard, Tomato.

3. Define the terms 'couplet' and 'lead' in taxonomic key. [AP & TS M-16, APM-15]

- A: 1) **Couplet**: The keys based on the contrasting characters in a pair are called couplet.
- 2) **Lead**: Each statement in the key is called a lead.

4. How are 'Viroids' different from 'Viruses'? [AP M-16, 17 IPE M-14]

A:	Viroids	Viruses
	1) Viroids are infectious agents to plants	1) Viruses are infectious agents to all organisms
	2) Protein coat is absent.	2) Protein coat is present.
	3) Viroids contain nucleic acid only .	3) Viruses contain nucleic acid & protein coat .
	4) Their nucleic acid consists of only RNA.	4) The nucleic acid may be RNA or DNA.

5. What is "Omega Taxonomy"?**[AP M-15,19][TS M-20]**

A: Omega Taxonomy is an advanced taxonomy which deals with Embryology, Cytology, Palynology, Phytochemistry, Serology etc., along with Morphology.

6. Differentiate actinomorphic from zygomorphic flower.**[TS M-19] [TS May-17][AP M-16]**

A:	Actinomorphic flower	Zygomorphic flower
	1) Actinomorphic flower can be cut into two equal halves in any vertical plane.	1) Zygomorphic flower can be cut into two equal halves in one vertical plane.
	2) Ex: Datura, Hibiscus	2) Ex: Bean, Pea

7. What is referred to as satellite chromosome? [AP M-19,20][AP,TS May-17]

A: 1) Some chromosomes contain a small segment called satellite which is separated from the main body of the chromosome by a secondary constriction.

2) Such chromosomes are called satellite chromosomes.

8. Hydrophytes show reduced xylem. Why? [AP M-17,20,22][TS M-15,19]

A: 1) In hydrophytes, absorption of water takes place through all over the surface of the plant body.

2) All submerged organs are capable of absorbing water. So, their xylem is reduced.

9. Explain the Zwitterionic form of an amino acid.**[IPE Mar- 14]**

A: 1) The amino acid has both acidic and basic groups.

2) It carries both the positive and negative charges in equal number and exists as dipolar ion.

3) Also, the net charge on it is zero. Hence amino acid takes the form of **zwitter ion**.

10. An anther has 1200 pollen grains. How many pollen mother cells must have been there to produce them?**[AP MAY-19][AP M-15,16,17][TS M-17,20]**

A: 1) 300 pollen mother cells.

2) **Reason:** $\frac{1}{4}(1200) = 300$

SECTION-B

11. **List the changes observed in angiosperm flower subsequent to pollination and fertilisation.** [AP M-16,17,23] [IPE- 14,13][TS May-17]

A: A) Post-Pollination effects:

- 1) The pollen grain germinates on the stigma to produce a pollen tube.
- 2) Pollen tube grows through the tissues of the stigma and style and reaches the ovary.
- 3) Later Pollen tube enters into the ovule by porogamy or chalazogamy or mesogamy.
- 4) After entering into the embryo sac, the pollen tube bursts and releases the two male gametes into the cytoplasm of the synergid.
- 5) The first male gamete fuses with egg and forms a diploid zygote.
- 6) The second male gamete fuses with the second nucleus and forms a PEN.

B) Post-fertilization effects:

- 1) Calyx, corolla, stamens, style and stigma wither and drop away.
- 2) Fertilized ovary develops into fruit.
- 3) After fertilisation, ovules become seeds.
- 4) Zygote develops into embryo.
- 5) Antipodals degenerate. Synergids degenerate.
- 6) Primary endosperm nucleus becomes endosperm.
- 7) Integuments become seed coats.
- 8) Micropyle of the ovule become micropyle of the seed.

12. **Differentiate between red algae and brown algae.** [TS M-17,19,22][AP M-16,19]

A:

Red Algae	Brown Algae
1) Red algae belongs to Rhodophyceae class. 2) Their red colour is due to the red pigment called r-phycoerythrin. 3) Major pigments in them are chlorophyll a,d and phycoerythrin. 4) Reserve food material is Floridian starch. 5) Asexual reproduction is by non-motile spores. 6) Sexual reproduction is by non-motile gametes. Ex: Gracilaria, Gelidium	1) Brown algae belongs to Phaeophyceae class. 2) Their brown colour is due to the brown pigment fucoxanthin. 3) Major pigments in them are chlorophyll a,c, carotenoids and xanthophylls 4) Reserve food material is laminarin (or) mannitol. 5) Asexual reproduction is by biflagellate zoospores. 6) Sexual reproduction is by motile gametes. Ex: Ectocarpus, Laminaria, Fucus.

13. Give a brief account of Dinoflagellates. [AP M-17,19] [TS M-15,16,19,22]**A:** 1) Dinoflagellates belong to **kingdom Protista**. **[AP May-19]**

- 2) They are a large group of **flagellate eukaryotes**.
- 3) Dinoflagellates are seen **mostly in marine water**.
- 4) **Ex:** Red Dino flagellates like Gonyaulax in Medeterranian sea.
- 5) They appear in **various colours depending upon their pigments**.
- 6) The outer surface of their **cell wall** has **stiff cellulose**.
- 7) They have two flagellae, **one lies longitudinally and the other lies transversely**.
- 8) The **flagellae** produces **spinning movements**, so these are called **whirling whips**.
- 9) The nucleus has **condensed chromosomes**.
- 10) Due to absence of histones, nucleus is called **mesokaryon**.
- 11) Marine dinoflagellates like Noctiluca show **bioluminescence**.
- 12) Toxins released by dinoflagellates may harm to animal cules.

14. What are the characteristics of prokaryotic cell?**A: Characteristics of prokaryotic cell:**

- 1) Prokaryotic cells have both the cell wall and cell membrane.
- 2) **There is no well defined nucleus**. The nuclear membrane is absent.
- 3) They are smaller, multiply more rapidly and vary greatly in shape and size.
- 4) The fluid matrix of the cell is the cytoplasm.
- 5) The genetic material is naked, it is in the form of a single chromosome or circular DNA.
- 6) Smaller circular DNA called plasmids are present out side the genome.
- 7) The cell organelles, which are found in eukaryotes are absent, except the ribosomes.
- 8) The **infoldings of plasma membrane are called mesosomes**.
- 9) The prokaryotic cells are seen in bacteria, blue-green algae, mycoplasma and PPLO.

15. What is the difference between lenticels and stomata? [AP, TS Mar, May-17]**A:****Lenticels**

- 1) Lenticels are the aerating pores present on old stems and old aerial roots.
- 2) They contain closely arranged parenchymatous cells.
- 3) Lenticels are meant for the exchange of gases between the outer atmosphere and the internal tissues of woody organs.
- 4) Opening and closing mechanisms are absent in lenticels.
- 5) Lenticels do not conduct photosynthesis.

Stomata

- 1) Stomata are present on leaves and young stems.
- 2) Each stomata is guarded by two guard cells which contain chloroplasts.
- 3) Stomata help in transpiration and respiration of plants.
- 4) Opening and closing mechanisms are present in stomata.
- 5) Guard cells conduct photosynthesis.

16. Give economic importance of plants belonging to Fabaceae. [AP M-16,17,19]**A: Economic importance of Fabaceae plants:****[TS M-17,20]**

- 1) Pulses - These are the sources of proteins. **Ex:** Redgram, Black gram, Green gram, Bengal gram.
- 2) Edible oils- Soyabean (Glycine max), Ground nut (Arachis hypogea).
- 3) Vegetables- Pods of bean (Dolichos), Soyabean (Glycine max), leaves of Menth.
- 4) Timber - Red sanders, Indian rose wood.
- 5) Fiber- Sun hemp (Crotalaria)
- 6) Blue dye- Indigofera tinctoria, yellow dye- Butea monosperma.
- 7) Fodder - Crotalaria, Phaeolus
- 8) Green manure - Sesbania, Tephrosia

17. Though redundantly described as a resting phase, interphase does not really involve rest. Comment. [AP May-19,22][TS M-17,20,22][AP Mar-15,16,17,19,20]

A: Interphase: The state of cell cycle, at which, the nucleus is not in a state of division, is called Inter phase. It is the period of preparation for cell division. This stage occurs between two successive cell divisions.

The inter phase is called resting phase. But during this time, the cell prepares for division by undergoing both cell growth and DNA replication in an orderly manner. The inter phase is divided into 3 sub stages- G_1 phase, S phase and G_2 phase.

1) G_1 phase: This is the phase between mitosis phase and initiation of DNA replication. During G_1 phase the cell is **metabolically active** and it grows continuously; but **does not replicate its DNA**.

This G_1 phase includes

- a) Increase in the size of the cell.
- b) Synthesis of RNA and proteins.

2) S Phase: In this phase, **DNA replication takes place**. During this time the amount of **DNA per cell doubles**.

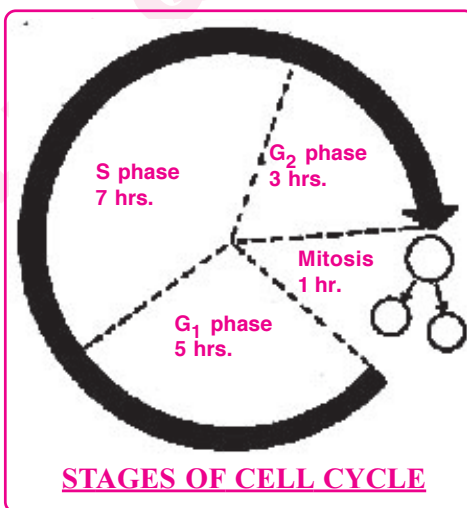
However, there is no increase in the chromosome number.

3) G_2 phase: During G_2 phase, the **synthesis of proteins and RNA continues**.

Various cell organelles are newly synthesized.

In view of the above 3 phases, we say interphase does not really involve rest.

☹ **Interphase is Restless Really**



18. List out the anatomical adaptations of hydrophytes.

[APMAY-19]

A: Anatomical adaptations of hydrophytes:

- 1) Cuticle is totally absent in the submerged parts of the plant.
- 2) It may be present in the form of a thin film on the surface of parts exposed to atmosphere.
- 3) The epidermis is composed of thin walled cells and it **performs absorption**.
- 4) The epidermal cells contain **chloroplasts and help in assimilation**.
- 5) **Stomata are totally absent in submerged hydrophytes**.
- 6) Gaseous exchange takes place directly through thin walled cells by **diffusion**.
- 7) In plants with floating leaves, the **leaves are epistomatous**.
- 8) All hydrophytes contain aerenchyma that helps in gaseous exchange and buoyancy.

SECTION-C

19. Describe the internal structure of a Dicot Root.

[TS M-22[AP May-19,22]

A: T.S of Dicot Root shows three main parts. They are I) Epidermis II) Cortex III) Stele

I) Epidermis:

- 1) It is the outermost layer
- 2) It is made up of single layered rectangular cells.
- 3) It contains root hairs. They help in absorption of water.
- 4) Cuticle and stomata are absent.
- 5) Epidermis is useful in the protection of inner tissue.

II) Cortex: The Region between epidermis and stele is called cortex. It has three subparts.

1) Exodermis:

- i) It is 2 to 3 layered thick suberised cells.
- ii) It prevents the exit of water from cortex.

2) Parenchyma (General Cortex):

- i) It is found below the hypodermis and is made up of thin walled parenchyma.
- ii) They enclose a number of glands.

3) Endodermis:

- i) It is the inner most layer of the cortex.
- ii) Cylindrical cells are tightly arranged.
- iii) Endodermis contains '**casparian thickenings**' deposited with suberin in cell wall.

III) Stele: Stele is the central conducting cylinder

It has three parts (1) Pericycle
(2) Vascular bundles (3) Medulla

1) Pericycle:

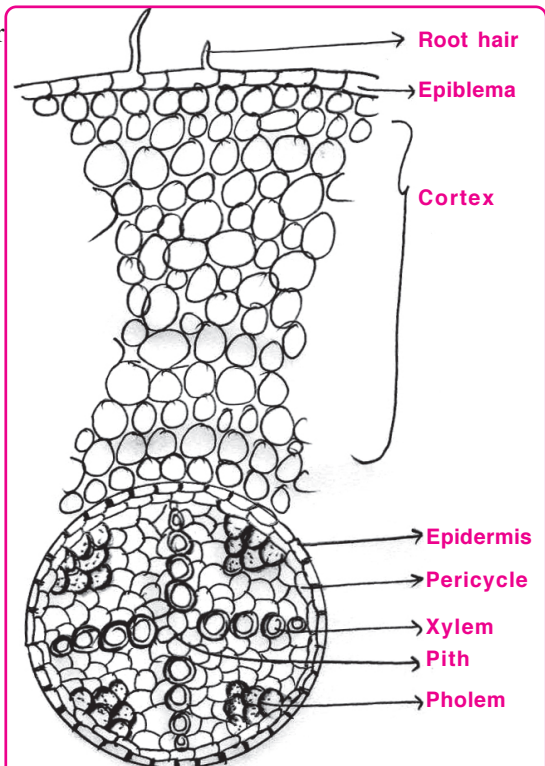
- i) Pericycle is with single layer of cells surrounding the stele.
- ii)* Secondary growth is observed .

2) Vascular bundles:

- i) Vascular bundles contain xylem and phloem on separate radii.
- ii)* Usually 4 xylem bundles alternate with 4 phloem bundles.
- iii)* This condition is called '**Tetrach**'.
- iv) Xylem transports water.
Phloem transports food.

3) Medulla (or) Pith :

- i)* Medulla is small (or) absent.
- ii) It helps in the storage of food and water.



TS OF DICOT ROOT

20. With a neat, labelled diagram, describe the parts of a mature angiosperm embryo sac. Mention the role of synergids. [TS 20,22][AP & TS M-16,17,19]

A: The mature angiosperm embryo sac has three parts.

1) Egg apparatus 2) Central cell 3) Antipodals

1) Egg apparatus:

- Three cells grouped together at the **micropylar end** constitute the egg apparatus.
- They are two synergids and one egg cell.
- The synergids with special cellular thickenings at the micropylar end is called filiform apparatus.
- The middle largest cell is called egg or oospore.

2) Central cell:

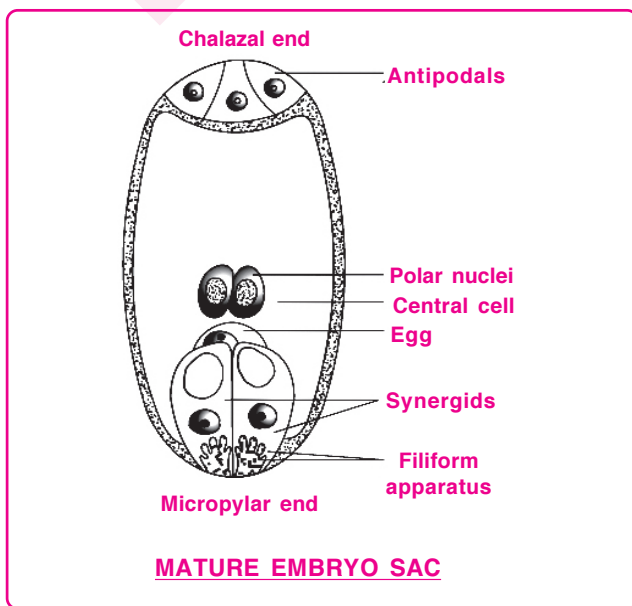
- It is the **largest cell** of embryo sac.
- It has two polar nuclei which fuse to form a single diploid secondary nucleus.

3) Antipodals:

- Three cells present at the **chalazal end** of embryo sac are called antipodals.
- These are smallest cells of embryo sac.
- They degenerate before or after fertilisation.
- They are considered as vegetative cells of embryo sac.

Role of Synergids:

- Absorption of nutrients from the nucellus into the embryo sac.
- Nourishing female gametophyte nutrients.
- Guiding the pollen tube into Egg cell.



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Boxes

21. Explain how stem is modified variously to perform different functions.

[AP M-19,20][AP May-17,22][TS M-16, IPE-14]

A: Stem: The aerial part of the flowering plant is called stem.

Stem Modification: A permanent structural change in the stem to perform some special functions suitable to the environment is called stem modification. This is of three types.

I) Underground stem modification II) Aerial stem modification

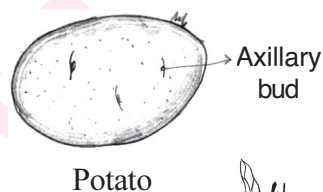
III) Sub-aerial stem modification.

I) Underground stem modification:

- 1) In some plants, the stems grow into soil.
- 2) They can withstand unfavourable conditions and become Perennial plants.
- 3) They perform **vegetative propagation**. They store **food material**.

Examples of Underground stems :

- | | |
|----------------------|-------------------------|
| a) Rhizome of ginger | b) Bulb of Onion |
| c) Corm of Colocasia | d) Stem tuber of Potato |



II) Aerial stem modification: This is of four types.

1) Stem tendrils:

- i) These are slender, spirally coiled structure.
- ii) They help in **climbing up**.

Ex: Axillary bud is modified into a tendril in **cucumber, watermelon**.

Terminal bud is modified into a tendril in **grape vines**.



2) Thorns:

- i) The buds of the stem which modify into woody, straight and pointed structures are called thorns.
- ii) They **protect** the plant from **grazing animals**.

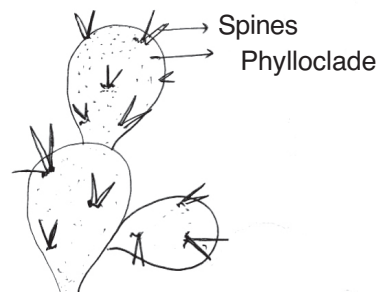
Ex: Bougainvillea, citrus.



3) Phylloclades:

- i) In some xerophytes, the leaves are modified to reduce transpiration.
- ii) Their stems become green, flat and photosynthetic to perform **photosynthesis**.

Ex: Opuntia, Euphorbia, Casuarina.

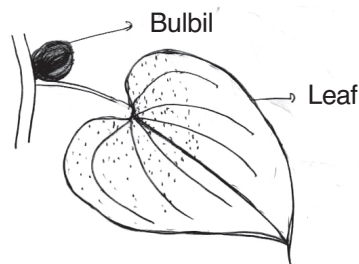


4) Bulbils:

- i) Some plants detach from the parent plant, and develop adventitious roots(buds) to store food.
- ii) Such buds are called bulbils.
- iii) This helps in **vegetative reproduction**.

Ex: Floral buds (Agave),

Vegetative buds (Dioscorea)



III) Sub-aerial stem modification:

Here the stems are partly aerial and partly underground.
They help in vegetative propagation. They are four types.

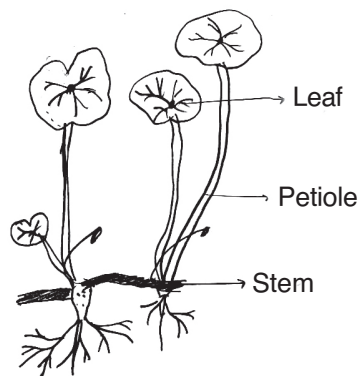
☺ **SECOND is Sure,
if FIRST is missed.**

ఈ రెండూ రెండే! దేనిని వదలొద్దు!

1) Runner:

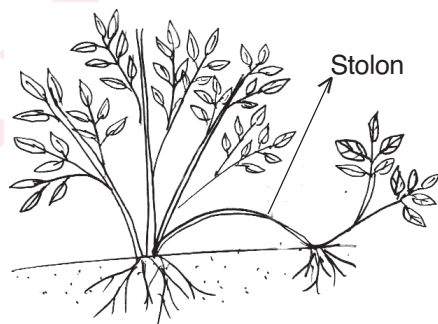
- i) In some plants, subaerial stems spread to new niches and **form new plants** when older parts die.
- ii) Such plants are called runners.

Ex: Strawberry, Oxalis.

**2) Stolon:**

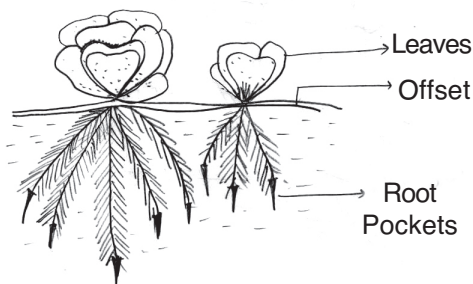
- i) In some plants, a slender lateral branch grows aurally.
- ii) After some time, it arches downwards to touch the ground and **produce adventitious roots**.
- iii) Such branches are called stolons.
- iv) When detached from the parent plant they lead independent life.

Ex: Jasmine, Nerium, Mint plant

**3) Offset:**

- i) 'One internode length' of a lateral branch of aquatic plants is called 'offset'.
- ii) It bears a rosette of leaves at each node and a tuft of balancing roots.

Ex: Pistia and Eichhornia

**4) Sucker:**

- i) In some plants, a part of the stem lies in the underground.
- ii) Some lateral branches originate from the main stem.
- iii) They grow horizontally and then come out obliquely upwards giving rise to leafy shoots.
- iv) These branches are called suckers.

Ex: Banana, Chrysanthemum

