TIPS TO BIO-BOTANY TEACHERS

- If the students concentrate more on the units 1, 2 & 5 they can score 69/75 marks.
- As most of the 5 and 10 marks questions of the above 3 units are already existed in practical syllabus, it is very easy to prepare the above 3 units for theory exam to score maximum marks.
- Remaining 6 marks out of 69/75 can be easily achieved by studying the frequently asked one mark questions of the chapters 3,4 & 6.
- As 8 to 13 marks weightage may be given to diagrammatic questions, it is necessary to give importance to the frequently asked diagrammatic questions.
- If students completely go through this materials they can score maximum marks.
- For the 3 marks questions like Define, What is’, the students must quote the examples, then only they can be awarded the full marks.
- For 5 and 10 marks questions students must draw the diagram and label the parts where ever necessary, then only they can be awarded full marks.
- For flowchart questions from plant physiology chapter, the students must write the definitions along with flowchart to score full marks.
- It is necessary to note that the compulsory 5 marks question mostly asked from the 1st unit Taxonomy of Angiosperms.
- To score high marks more importance should be given to the 3 and 5 marks differentiate questions from the units 1,2,3 and 5.
- As in Bio-Botany most of the questions were asked from the book back questionnaire, it is necessary to concentrate more on this.

1
### BLUE PRINT
**BIO – BOTANY**

<table>
<thead>
<tr>
<th>S. no</th>
<th>Units</th>
<th>Marks / Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>TAXONOMY OF ANGIOSPERMS</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PLANT ANATOMY</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>CELL BIOLOGY AND GENETICS</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BIO-TECHNOLOGY</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>PLANT PHYSIOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>BIOLOGY IN HUMAN WELFARE</td>
<td>2</td>
</tr>
</tbody>
</table>

**STAGE - 1 : To score the minimum marks 30 and above**

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Units</th>
<th>Marks / Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>TAXONOMY OF ANGIOSPERMS</td>
<td>3(37)</td>
</tr>
<tr>
<td>2</td>
<td>PLANT ANATOMY</td>
<td>2(30)</td>
</tr>
<tr>
<td>3</td>
<td>PLANT PHYSIOLOGY</td>
<td>3(38)</td>
</tr>
</tbody>
</table>
As most of the 5 and 10 marks questions of the above 3 units are already existed in practical syllabus, it is very easy to prepare the above 3 units for theory exam to score maximum marks.

If students concentrate completely on this study material they can easily succeeded in the public exam.

STAGE - 2: To score 70 marks and above

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Units</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TAXONOMY OF ANGIOSPERMS</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>PLANT ANATOMY</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>PLANT PHYSIOLOGY</td>
<td>3</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>32</td>
</tr>
</tbody>
</table>

If the students concentrate more on the units 1, 2 & 5 they can score 69/75 marks.

As most of the 5 and 10 marks questions of the above 3 units are already existed in practical syllabus, it is very easy to prepare the above 3 units for theory exam to score maximum marks.

Remaining 6 marks out of 69/75 can be easily achieved by studying the frequently asked one mark questions of the chapters 3, 4 & 6.
1. TAXONOMY OF ANGIOSPERMS

3 MARKS

1. What is binomial nomenclature?
   Every species is given a name of two words. Ex: Mangifera indica. Here the first word Mangifera refers to the genus name and the second words indica to the species name.

2. Write the objectives of classification of plants?
   - To arrange plants in an orderly sequence based upon their similarities.
   - The closely related plants are kept within a group and unrelated plants are kept far apart in separate groups.
   - To establish phylogenetic relationships among the different groups of plants.

3. What are the aims of biosystematics?
   - To delimit the naturally occurring biotic community of plants species.
   - To recognise the various groups as separate biosystematic categories such as ecotypes, ecospecies, cenospecies and comparium.

4. Define biosystematics.
   Biosystematics may be defined as taxonomy of living population. The characteristics and differences from other disciplines of science such as cytology, genetics, Bio chemistry, phytogeography, numerical taxonomy, molecular biology are taken into consideration.

5. What are the three classes of phanerogams?
   (1) Dicotyledonae  (2) Gymnospermae (3) Monocotyledonae

   Herbarium is a collection of pressed, dried plant specimens mounted on specified sheets, indentified and arranged in the order of an approved and well known system of classification. Ex: Herbarium of Botanical survey of India, Coimbatore.
7. Write short notes on monoclamydeae?

Plants having flowers with single whorl of perianth. The sepals and petals are not distinguished. Sometimes both the whorls are absent.
It includes 8 series and 36 families.

8. Name any three fibre plants of Malvaceae.

1. Gossypium barbadense (Egyptian cotton)
2. Gossypium hirsutum (American cotton)
3. Gossypium barbasium (Cotton)

9. Write the systematic position of Malvaceae

Class : Dicotyledonae
Sub-class : Polypetalae
Series : Thalamiflorae
Order : Malvales
Family : Malvaceae

10. What is Epicalyx? Is it present in Abutilon indicum?

Bracteoles forming a whorl outer to the calyx is called epicalyx. It is absent in Abutilon indicum. In malva sylvestria 3 bracteles is present.

11. Mention the binomial of any three medicinal plants of Malvaceae.

1. Abutilon indicum
2. Malva sylvestris
3. Althaeas rosea

12. What is Atropine?

Roots of Atropa belladona yield powerful alkaloid â€œatropineâ€ It is used for relieving muscular pain.
13. Write the binomial of any three medicinal plants of Solanaceae.
   1. Atropa belladona
   2. Solanum trilobatum
   3. Withania somnifera

14. Name the alkaloids found in tobacco.
    (1) Nicotine  (2) Nornicotine  (3) Anabasine

15. Write the systematic position of Euphorbiaceae.
    Class : Dicotyledonae
    Sub class : Monochlamydeae
    Series : Unisexualae
    Family : Euphorbiaceae

16. What is Cladode? Give an example
    The Stem is modified to perform photosynthesis. This modified stem is called Cladode. Eg. Euphorbia tirucalli.

17. Write the systematic position of Musaceae
    Class : Monocotyledonae
    Series : Epigynae
    Family : Musaceae

18. What is polygamous?
    Staminate flowers, pistillate flowers and bisexual flowers are present in the same plant. Eg. Musa

19. What is Monocarpic perennial?
    Musa is a monocarpic perennial, because it produces flowers and fruits once during its life time.
20. What is pseudostem? How it is formed in Musa?

In Musa the apparent, unbranched, erect aereal stem is the pseudostem. It is formed by the long, stiff and sheathy leaf bases which are rolled around one another.

5 MARK QUESTIONS

1. Bring out the significance of Herbarium

- Herbarium is a source of knowledge about the flora of a region or a locality or a country.
- It is a data store in which the information on plants are available.
- The type specimens help in the correct identification of plants.
- It provides materials for taxonomic and anatomical Research studies.
- Typical pollen characters have been well emphasized in taxonomy.

It is very much useful in the study of cytology, structure of DNA, numerical taxonomy, chemotaxonomy etc. It acts as a reservoir of gene pool studies.

- Because of its importance, several herbaria have been established at the National and International centres.

2. Write the salient features of ICBN

1. The generic name is a singular noun. The first letter of generic name is always written in capital. The specific epithet is an adjective and is always written with small letters.

2. The name should be short, precise and easy to pronounce.

3. The binomials are printed in italics or underlined. The generic and specific epithets are underlined separately. eg. Abutilon neilgherrense

4. When new names are given to any plant, then the herbarium preparation of the same specimen with its original description is preserved in any recognized herbarium. This specimen is denoted as type specimen.
5. The person who publishes the description of any plant for the first time or giving a new name to a plant is considered as author. The name of plant should bear the author’s abbreviated name at the end of specific epithet. This is called author citation. eg. Malva sylvestris Linn.

6. The original description of the plant should accompany the latin translation.

7. If naming the plant is from a source of error, it is regarded as ambiguous name. It is also called nomen ambiguum and is completely ignored from use.

8. If the generic and specific epithets are the same, it is called tautonym. eg. Sassafras. Such names are not accepted in the system of nomenclature.

3. Bring out the merits of Bentham and Hooker’s classification of plants.
   1. Bentham and Hooker’s classification is the most natural system, based on actual examination of specimens.
   2. The description of plants is quite accurate and reliable.
   3. As it is easy to follow, it is used as a key for the identification of plants in Kew herbarium and several other herbaria of the world.
   4. Although this system is natural, most of the aspects of this system show affinity to modern concepts of evolution. For example, Ranales which is the first order in the arrangement of plants, has been given a primitive position in this system.
   5. The placement of monocotyledonae after the dicotyledonae also appears to be in accordance with the evolutionary trends.
4. Write different types of inflorescence seen in Euphorbiaceae. Give examples for each.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Inflorescence</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Panicle</td>
<td>Ricinus communis</td>
</tr>
<tr>
<td>2</td>
<td>Simple Raceme</td>
<td>Croton sparsiflorus</td>
</tr>
<tr>
<td>3</td>
<td>Catkin</td>
<td>Acalypha indica</td>
</tr>
<tr>
<td>4</td>
<td>Solitary axillary cyme</td>
<td>Phyllanthus amarus</td>
</tr>
<tr>
<td>5</td>
<td>Cyathium</td>
<td>Euphorbia</td>
</tr>
</tbody>
</table>

5. Given an account of the economic importance of the family Malvaceae.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Binomial Name</th>
<th>Economically useful part</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fibre plants</td>
<td>Fibres obtained from surface of seeds</td>
<td>Used in textile industry</td>
</tr>
<tr>
<td></td>
<td>Gossypium barbadense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Food plants</td>
<td>Fruits</td>
<td>Edible</td>
</tr>
<tr>
<td></td>
<td>Abelmoschus esculentus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Timber plants</td>
<td>Timber</td>
<td>To make Boat, furniture, and agriculture implements</td>
</tr>
<tr>
<td></td>
<td>Thespesia populnea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Medicinal plants</td>
<td>Roots, Leaf</td>
<td>To cure fever, To cure Whooping Cough</td>
</tr>
<tr>
<td></td>
<td>Abutilon indicum and Malva sylvestris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ornamental Plants</td>
<td>Full Plant</td>
<td>Ornamental plants</td>
</tr>
<tr>
<td></td>
<td>Althaea rosea</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Given an account of the economic importance of the family Euphorbiaceae

<table>
<thead>
<tr>
<th>S.No</th>
<th>Binomial Name</th>
<th>Economically useful part</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Food plants</strong></td>
<td>Fruits</td>
<td>Vitamin C rich food</td>
</tr>
<tr>
<td></td>
<td>Phyllanthus embilica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Oil plants</strong></td>
<td>Seeds</td>
<td>Lubricant, purgative vegetable oil</td>
</tr>
<tr>
<td></td>
<td>Ricinus communis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Medicinal plants</strong></td>
<td>Entire shoot system</td>
<td>To treat jaundice</td>
</tr>
<tr>
<td></td>
<td>Phyllanthus amarus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><strong>Rubber plants</strong></td>
<td>Latex</td>
<td>Para rubber</td>
</tr>
<tr>
<td></td>
<td>Hevea brasiliensis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>Ornamental Plants</strong></td>
<td>Full Plants</td>
<td>Ornamental plants</td>
</tr>
<tr>
<td></td>
<td>Euphorbia pulcherrima</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Write the differences between Musa and Ravenala.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Musa</th>
<th>Ravenala</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monocarpic perennial herb</td>
<td>Tree</td>
</tr>
<tr>
<td>2</td>
<td>The real stem is underground rhizome</td>
<td>The real stem is aerial and woody</td>
</tr>
<tr>
<td>3</td>
<td>Spiral phyllotaxy</td>
<td>Distichous phyllotaxy</td>
</tr>
<tr>
<td>4</td>
<td>Branched spadix inflorescence</td>
<td>Compound cyme inflorescence</td>
</tr>
<tr>
<td>5</td>
<td>Only five stamens are fertile</td>
<td>All the six stamens are fertile</td>
</tr>
<tr>
<td>6</td>
<td>Fruit is a Berry</td>
<td>Fruit is a capsule</td>
</tr>
</tbody>
</table>
8. Write the economic importance of Musaceae.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Binomial Name</th>
<th>Economically useful part</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Food plants</strong></td>
<td>Tender green fruit, Pseudostem, flowers</td>
<td>Edible</td>
</tr>
<tr>
<td></td>
<td>Musa paradisiacal (Banana)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Fiber plants</strong></td>
<td>Sheathy leaf bases</td>
<td>To make abaca cloth</td>
</tr>
<tr>
<td></td>
<td>Musa textilis (Manila hemp)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Ornamental plants</strong></td>
<td>Full plant</td>
<td>Ornamental plants</td>
</tr>
<tr>
<td></td>
<td>Strelitzia reginae (The bird of paradise flower)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ravenala madagascariensis (traveller’s palm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10 MARKS QUESTIONS

1. Discuss the outline of Bentham and Hooker’s classification of plants?
2. Describe *Hibiscus rosa-sinensis* in botanical terms.

Habit : Perennial shrub.

Root : Tap root system.

Stem : Aerial, erect, cylindrical, woody and branched.

Leaf : Simple, Alternate, petiolate, stipulate, serrate, glabrous, apex acuminate with multicostate reticulate venation.

Inflorescence : Solitary cyme and axillary.

Flower : Pedicel jointed, bracteate, bracteolate, bisexual, large, showy pentameric, dichlamydeous, actinomorphic, complete and hypogynous and mucilage is present in floral parts.

Epicalyx : 5 to 8 bracteoles outer to the calyx. They are green and free.

Calyx : Sepals 5, green, gamosepalous showing valvate aestivation and odd sepal is posterior in position.

Corolla : Petals 5, variously coloured, polypetalous, twisted aestivation.

Androecium: Numerous stamens, monadelphous. Anthers are monothecous, reniform, yellow, transversely attached to the filament, dehisce transversely and extrorse.

Gynoecium : Ovary superior, pentacarpellary and syncarpous.

Pentalocular With many ovules per locule on axile placentation.

**Floral formula**: $Br., Br_l., \oplus, \frac{1}{1}, K_{(5)}, C_s, A_{(\infty)}, G_{(5)}$

Floral Digram

12
3. Explain Datura metal in botanical terms.

Habit: Large, erect and stout herb.

Root: Branched tap root system.

Stem: The stem is hollow, green and herbaceous with strong odour.

Leaf: Simple, alternate, petiolate, entire or deeply lobed, glabrous showing unicostate reticulate venation and exstipulate.

Inflorescence: Solitary and axillary cyme.

Flower: Flowers are large, greenish white, bracteate, ebracteolate, pedicellate, complete, dichlamydeous, pentamerous, regular, actinomorphic, bisexual and hypogynous.

Calyx: Sepals 5, green, gamosepalous showing valvate aestivation. Calyx is mostly persistent and odd sepal is posterior in position.

Corolla: Petals 5, greenish white, gamopetalous, plicate (folded like a fan) showing twisted aestivation, funnel shaped with wide mouth and 10 lobed.

Androecium: Stamens 5, free from one another epipetalous, alternate the petals and are inserted in the middle of the corolla tube. Anthers are basifixed, dithecous with long filament, introrse and longitudinally dehiscent.

Gynoecium: Ovary superior, bicarpellary and syncarpous. Ovary basically bilocular but tetralocular due to the formation of false septa. Carpels are obliquely placed and ovules on swollen axile placentation.

Fruit: Spinescent capsule opening by four apical valves with persistent calyx.

Seed: Endospermous.
Floral Formula

\[
\text{Br., Ebrl., } \bigodot, \varphi, K(5), C(5), A_5, Q(2).
\]

Floral Diagram of Datura metal

4. Describe *Ricinus communis* in botanical terms.

**Habit**: Perennial shrub.

**Root**: Branched tap root system.

**Stem**: Aerial, erect, herbaceous but woody below, branched and hollow. Latex is present.

**Leaf**: Petiolate, extipulate, alternate. Venation is palmately reticulate divergent.

**Inflorescence**: Compound raceme or panicle and terminal.

**Male Flower**

Bracteate, ebracteolate, pedicellate, actinomorphic and Incomplete.

**Perianth**: Tepals 5, arranged in single whorl, gamophyllous, valvate aestivation and odd tepal is posterior in position.

**Androecium**: Stamens many, polyadelphous, filaments branched and united to form five branches. Anthers are dithecous.

**Gynoecium**: Absent but pistillode is present.

Floral Formula

\[
\text{Br., Ebrl., } \bigodot, \varphi, P(5), A_\infty, G_0
\]
**Female Flower**

Bracteate, ebracteolate, pedicellate, actinomorphic, incomplete and hypogynous.

**Perianth** : Tepals 3 arranged in single whorl and gamophyllous showing Valvate aestivation.

**Androecium** : Absent but staminode is present.

**Gynoecium** : Ovary superior, tricarpellary and syncarpous. Ovary trilocular with one ovule in each locule on axile placentation.

**Fruit** : Fruit is called regma.

**Seed** : Endospermous.

**Floral Formula** : Br., Ebrl, ☘, ♂, P(3), A₀, G(3).

### Male Flower

### Female Flower

5. **Describe Musa paradisiaca in technical terms**

**Habit** : Gigantic monocorpic perennial herb.

**Root** : Fibrous adventitious root system

**Stem** : The real stem is underground called rhizome. The apparent, unbranched, erect and areal pseudostem is formed by the long, stiff
and sheathy leaf bases which are rolled around one another to form an aerial pseudostem.

Leaf: Simple with a long and strong petiole, pinnately parallel venation, phyllotaxy is spiral.

Inflorescence: It is branced spadix.

Flowers: Bracteate, ebractiolute, sessile, trimerous, unisexual or bisexual, when unisexual, the flowers are monoecious. The flowers are zygomorphic and epigynous.

Perianth: Tepals 6, arranged in two whorls of 3 each. The three tepals of the outer whorl and the two lateral tepals of the inner whorl are fused by valvate aestivation to form 5 toothed tube like structure. The inner posterior tepal is alone free. It is distinctly broad and membranous.

Androecium: Stamens 6, in two whorls of 3 each, Only 5 stamens are fertile and the inner posterior stamen is either absent or represented by a staminode. Anthers are dithecous

Gynoecium: Ovary inferior, tricarpellary, syncarpous, trilocular, numerous ovules on axile placentation.

Fruit: An elongated fleshy berry

Floral formula: Bisexual flower

\[ Br, Ebrl, \%, \varphi P_{3(2)}+1, A_{3+3}, G_{3} \]
2. PLANT ANATOMY

3MARKS QUESTIONS

1. What are called passage cells?
   In roots the endodermal cells which are located opposite to the protoxylem are thin walled without casparian strips are called passage cells. They conduct water and mineral salts from cortex to the xylem elements.

2. What is a protoxylem lacuna?
   In monocot stem the lowest protoxylem of mature vascular bundle disintegrates and forms a cavity. This cavity is known as protoxylem lacuna.

3. What is an eustele?
   In dicot stem vascular bundles are arranged in the form of ring around the pith. This stele is known as eustele.

4. Differentiate palisade parenchyma from spongy parenchyma.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Palisade parenchyma</th>
<th>Spongy parenchyma</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Palisade cells are compactly arranged without intercellular spaces .</td>
<td>Spongy cells are very loosely arranged with numerous airspaces.</td>
</tr>
<tr>
<td>2</td>
<td>Palisade parenchyma contain more chloroplast.</td>
<td>Less number of chloroplast is seen.</td>
</tr>
<tr>
<td>3</td>
<td>This cells involved in photosynthesis.</td>
<td>This cells facilitate the exchange of gases.</td>
</tr>
</tbody>
</table>
5. What is a bundle sheath or border parenchyma in a leaf?

In leaf vascular bundles are surrounded by a compact layer of parenchymatous cells. This is known as bundle sheath.

6. Differentiate sclereids from fibres.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Sclereids</th>
<th>Fibres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sclereids are shorter</td>
<td>Fibres are longer</td>
</tr>
<tr>
<td>2</td>
<td>Sclereids possess numerous pits.</td>
<td>Fibres has less number of pits.</td>
</tr>
<tr>
<td>3</td>
<td>Sclereids have blunt ends.</td>
<td>Fibres have sharp edged.</td>
</tr>
</tbody>
</table>

7. Differentiate bundle sheath from bundle cap.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Bundle sheath</th>
<th>Bundle cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A compact layer of parenchymatous cells surrounds the vascular bundle is known as bundle sheath.</td>
<td>A patch of sclerenchyma present above the phloem is known as bundle cap</td>
</tr>
<tr>
<td>2</td>
<td>In monocot stem it is made up of sclerenchyma. In dicot leaf it is made up of parenchyma.</td>
<td>In dicot stem it is made up of sclerenchyma.</td>
</tr>
</tbody>
</table>

5MARK QUESTIONS

1. Explain different types of meristems based on their positions.

   Based on its position, the meristem is divided into three types: apical meristem, intercalary meristem and lateral meristem.

   **Apical meristem:**
   1. Apical meristem is found at the tips of roots, stem and branches.
   2. It is responsible for increase in length of plant.
3. It is divided into three zones—protoderm, procambium and ground meristem. Protoderm gives rise to epidermal tissue; procambium gives rise to primary vascular tissues and ground meristem gives rise to cortex and pith.

**L.S of shoot- Showing the positions of meristems**

**Intercalary meristem:**

1. It is present in the nodal region and is prominently found in Monocotyledons, eg. grasses.
2. It is present in between the permanent tissues.
3. It is responsible for the elongation of internodes.

**Lateral meristem:**

1. The meristem that is present along the longitudinal axis of stem and root.
2. Vascular cambium and cork cambium (phellogen) are examples for lateral meristem.
3. It produces secondary permanent tissues, which result in the thickening of stem and root.

**2. Functions of epidermal tissue system.**

1. This tissue system in the shoot checks excessive loss of water due to the presence of cuticle.
2. Epidermis protects the underlying tissues.
3. Stomata involve in transpiration and gaseous exchange.
4. Trichomes are also helpful in the dispersal of seeds and fruits.
5. Root hairs absorb water and mineral salts from the soil.
3. Distinguish the anatomy of dicot roots from monocot roots.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Monocot roots</th>
<th>Dicot roots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Xylem is polyarch.</td>
<td>Xylem is usually tetrarch.</td>
</tr>
<tr>
<td>2</td>
<td>Pith is usually large at the centre</td>
<td>Pith is usually absent.</td>
</tr>
<tr>
<td>3</td>
<td>Metaxylem vessels are generally circular in cross section.</td>
<td>Metaxylem vessels are generally polygonal in cross section.</td>
</tr>
<tr>
<td>4</td>
<td>Conjunctive tissue is sclerenchymatous in Maize.</td>
<td>Conjunctive tissue is usually parenchymatous.</td>
</tr>
<tr>
<td>5</td>
<td>There is no secondary growth.</td>
<td>Secondary growth is generally present.</td>
</tr>
</tbody>
</table>

10 MARKS QUESTIONS

1. Describe the vascular tissue system.

- The elements of xylem and phloem are always organized in groups. They are called vascular bundles.
- **OPEN VASCULAR BUNDLE**- If cambial tissue is present between xylem and phloem is known as open vascular bundle. Ex: Dicot stem.
- **CLOSED VASCULAR BUNDLE**: If cambial tissue is absent between xylem and phloem, it is known as a closed vascular bundle. **Ex**: Monocot stem.

- **RADIAL ARRANGEMENT**: Xylem and phloem are arranged in an alternate manner on different radii. **Ex**: Roots

- **CONJOINT VASCULAR BUNDLE**: Xylem and phloem are arranged at the same radius and form a vascular bundle together. They are divided into three types.

  1. **COLLATERAL VASCULAR BUNDLE**: If xylem and phloem in a vascular bundle are arranged along the same radius with phloem towards the outside. **Ex**: Stem and leaf.

  2. **BICOLLATERAL VASCULAR BUNDLE**: If phloem occurs on both the outer and inner sides of xylem, the bundle is called bicollateral. **Ex**: Cucurbitaceae.

  3. **CONCENTRIC VASCULAR BUNDLE**: The bundle in which either phloem surrounds the xylem or xylem surrounds the phloem completely.

    a) **amphicribal**: The phloem completely surrounds the xylem. **Ex**: Polypodium.
    
    b) **amphivasal**: The xylem completely surrounds the phloem. **Ex**: Acorus

- **EXARCH XYLEM**: Protoxylem vessel points towards the periphery and the metaxylem vessels towards the centre. **Ex**: Roots

- **ENDARCH XYLEM**: Protoxylem vessels point towards the centre, while metaxylem towards the periphery. **Ex**: Stem.

2. **Describe the primary structure of a Monocot root.**

   **Rhizodermis or epiblema**

   1. It is the outermost layer. It consists of a single row of thin-walled parenchymatous cells.

   2. Stomata and cuticle are absent.

   3. Root hairs are unicellular. They absorb water and mineral salts from the soil.

   4. It protects the inner tissues.

   **Cortex:**

   1. Many layers of thin-walled parenchyma cells.
2. Generally oval or rounded in shape. Chloroplasts are absent in the cortical cells. Leucoplasts store starch grains.
3. The inner most layer of the cortex is endodermis. It is composed of single layer of barrel shaped parenchymatous cells.
4. There is a band like structure made of suberin present in the radial and transverse walls of the endodermal cells. They are called Casparian strips. It prevent the re-entry of water into the cortex.
5. The endodermal cells, opposite to the protoxylem are thin-walled without casparian strips called passage cells. It transport water and salts from the cortex to the xylem.

**Stele:** All the tissues inside the endodermis comprise the stele. This includes pericycle, vascular system and pith.

**Pericycle:** outermost layer of the stele. It consists of a single layer of parenchymatous cells.

**Vascular System:** radial arrangement, polyarch, exarch, conjunctive tissue is sclerenchymatous.

**Pith:** parenchymatous, store starch grains.

3. **Describe the primary structure of a Dicot root.**

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**Pericycle:** outermost layer of the stele. It consists of a single layer of parenchymatous cells.

**Vascular System:** radial arrangement, tetrarch, exarch, conjunctive tissue is parenchymatous.

**Pith:** pith is absent.

### 4. Describe the primary structure of a monocot stem.

**Epidermis:**

1. It is the outermost layer. It is made up of single layer of tightly packed parenchymatous cells.
2. Cuticle and stomata are present.
3. It protect inner most tissues.

**Ground tissue:**

1. There is no distinction into cortex, endodermis, pericycle and pith.
2. It is made of many layered parenchymatous cells.
3. Vascular bundles are scattered in the parenchymatous ground tissue. The ground tissue stores food and performs gaseous exchange.

**Vascular bundles:**

1. Skull shaped, conjoint, collateral, endarch and closed.
2. vascular bundle is surrounded by a sheath of sclerenchymatous fibres

**Phloem:** It consists of sieve tubes and companion cells.

**Xylem:** Y-shaped, in mature vascular bundle, the lowest protoxylem disintegrates and forms a cavity known as protoxylem lacuna.

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5. **Describe the primary structure of a Dicot stem.**

**Epidermis:**
1. It is the outermost layer. It is made up of single layer of tightly packed parenchymatous cells.
2. Epidermal hair, cuticle and stomata are present.
3. It protects innermost tissues.

**Cortex:**

Cortex is differentiated into three zones.
1. Hypodermis is collenchymatous, giving mechanical strength to the stem.
2. Chlorenchyma cells perform photosynthesis.
3. Parenchyma cells store food materials.

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**T.S. of sunflower stem**

**Starch sheath:** The innermost layer of the cortex, barrel-shaped parenchymatous layer. Starch grains are abundant, hence morphologically homologous to the endodermis found in the root.

**Stele:** The central part of the stem inner to the endodermis is known as stele. Vascular bundles are arranged in a ring around the pith. So it is called eustele.

**Pericycle:** Made of parenchyma and sclerenchyma. A patch of sclerenchyma cells on top of the phloem is called as bundle cap or hard bast.

**Vascular bundles:** Wedge shaped conjoint, collateral, open, and endarch.

**Phloem:** It consists of sieve tubes, companion cells, and phloem parenchyma.

**Cambium:** It is made of two or three layered brick-shaped cells.

**Xylem:** It consists of xylem fibres, xylem parenchyma, vessels, and tracheids.
**Pith:** It is composed of parenchyma cells with intercellular spaces. Function of the pith is storage of food.

6. **Write anatomical differences between dicot stem and monocot stem.**

<table>
<thead>
<tr>
<th>Dicot stem</th>
<th>Monocot stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hypodermis is made up of collenchymatous cells.</td>
<td>1. Hypodermis is made up of sclerenchymatous cells.</td>
</tr>
<tr>
<td>2. Ground tissue is differentiated into cortex, endodermis, pericycle and pith.</td>
<td>2. Ground tissue is not differentiated, but it is a continuous mass of parenchyma.</td>
</tr>
<tr>
<td>3. Starch sheath is present.</td>
<td>3. Starch sheath is absent.</td>
</tr>
<tr>
<td>4. Pith is present.</td>
<td>4. Pith is absent.</td>
</tr>
<tr>
<td>5. Pericycle is present.</td>
<td>5. Pericycle is absent.</td>
</tr>
<tr>
<td>6. Medullary rays are present.</td>
<td>6. Medullary rays are absent.</td>
</tr>
<tr>
<td>7. Vascular bundles are open.</td>
<td>7. Vascular bundles are closed.</td>
</tr>
<tr>
<td>8. Vascular bundles are arranged in a ring.</td>
<td>8. Vascular bundles are scattered in the ground tissue.</td>
</tr>
<tr>
<td>9. Bundle cap is present.</td>
<td>9. Bundle sheath is present.</td>
</tr>
<tr>
<td>10. Protoxylem lacuna is absent.</td>
<td>10. Protoxylem lacuna is present.</td>
</tr>
<tr>
<td>11. Phloem parenchyma is present.</td>
<td>11. Phloem parenchyma is absent.</td>
</tr>
</tbody>
</table>

7. **Describe the internal structure of a dicot leaf.**

**Epidermis:**

1. It has upper and lower epidermis. It is made up of a single layer of cells that are closely packed.
2. Stomata are more in number on the lower epidermis than on the upper epidermis.
3. The cuticle on the upper epidermis is thicker than that of lower epidermis.
4. It gives protection to the inner tissues called mesophyll.
**Mesophyll:** The entire tissue between the upper and lower epidermis is called the Mesophyll. There are two regions in the mesophyll.

**Dorsiventral leaf:** palisade parenchyma on the adaxial (upper) side and spongy parenchyma on the abaxial (lower) side is called Dorsiventral leaf. Ex: Sunflower leaf.

**Palisade parenchyma:** 1. Cells seen beneath the upper epidermis. Vertically elongated cylindrical cells in one or more layers. It contain more chloroplasts. Function is photosynthesis.

**Spongy parenchyma:** lies below the palisade parenchyma, irregularly shaped, very loosely arranged with numerous airspaces. It contain lesser number of chloroplasts. It facilitate the exchange of gases.

**Respiratory cavity:** The air space that is found next to the stoma is called respiratory cavity or sub-stomatal cavity.

**Bundle sheath or border parenchyma:** Vascular bundles are surrounded by a compact layer of parenchymatous cells called bundle sheath or border parenchyma.

**Vascular bundle:** conjoint, collateral and closed. Protoxylem vessels are present towards the upper epidermis. Metaxylem vessels are present towards the lower epidermis.
UNIT 5 PLANT PHYSIOLOGY

3 MARKS QUESTIONS

1. What is photolysis of water?
   When the PS II is in oxidised state, it creates a potential to split water molecules to protons, electrons and oxygen. This light dependent splitting of water molecules is called photolysis of water.

2. Define photophosphorylation.
   The process of ATP formation from ADP in the presence of light in chloroplast is called photophosphorylation.

3. State the conditions under which cyclic photophosphorylation occurs.
   (i) PS I only remains active (ii) photolysis of water does not take place (iii) requirement of ATP is more and (iv) non availability of NADP+

4. Why are chloroplasts in C4 plants called dimorphic chloroplasts?
   The C4 plants contain dimorphic chloroplasts i.e. chloroplasts in mesophyll cells are granal (with grana) whereas in bundle sheath chloroplasts are agranal (without grana).

5. Write the differences between photo respiration and dark respiration.

<table>
<thead>
<tr>
<th>Sno</th>
<th>Photo respiration</th>
<th>Dark respiration.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It takes place only in photo synthetic cells in the presence of light.</td>
<td>It takes place in all living cells in the mitochondria.</td>
</tr>
<tr>
<td>2</td>
<td>It is light dependent</td>
<td>It takes place in the presence and in the absence of light.</td>
</tr>
<tr>
<td>3</td>
<td>It is the function of chloroplast, peroxisomes and mitochondria.</td>
<td>It is the function of mitochondria alone.</td>
</tr>
</tbody>
</table>
6. Define chemosynthesis.

Chemosynthesis is a process by which certain organisms synthesize carbohydrates by using energy obtained by the oxidation of inorganic substances. Eg. Beggiatoa, Nitrosomonas.

7. Define respiratory quotient.

Respiratory quotient may be defined as the ratio between the volume of carbondioxide given out and oxygen consumed during respiration.

8. Draw the structure of ATP?

![ATP Structure]

9. What is compensation point?

The concentration of CO₂ at which photosynthesis just compensates the respiration is referred to as carbondioxide compensation point.

10. What is fermentation?

Fermentation literally means a chemical change accompanied by effervescence. The anaerobic breakdown of glucose to carbondioxide and ethanol is a form of respiration referred to Fermentation.

11. What is apical dominance?

Suppression of growth in lateral bud by apical bud due to auxin produced by apical bud is termed as apical dominance.

12. Define Bolting.

Rosette plants exhibit excessive internodal growth when they are treated with gibberellin. This sudden elongation of stem followed by flowering is called bolting.

13. What is Richmond Lang effect?

Application of cytokinin delays the process of ageing in plants. This is known as Richmond Lang effect.
14. **What is Sigmoid Curve?**

   The growth in size or increase in number of cells if plotted against time the graph shows S-shaped curve known as sigmoid growth curve.

15. **Define photoperiodism.**

   The response of a plant to the relative lengths of light and dark periods is known as photoperiodism.

16. **Define vernalization.**

   Many species, especially biennials and perennials are induced to flower at low temperature range of 1°C to 10°C. This is known as vernalization.

17. **Write the advantages of vernalization?**

   (1) Crops can be produced earlier by vernalization.
   (2) They can be cultivated in places where they naturally do not grow.
   (3) Vernalization helps to accelerate the plant breeding.

18. **Write the different phases of growth with sigmoid curve.**

   (1) Lag phase (2) Log phase (3) Steady state phase

19. **Write the overall equations of respiration and glycolysis.**

   **Respiration**
   \[ C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy (2900 kJ)} \]

   **Glycolysis**
   \[ C_6H_{12}O_6 + 2ADP + 2Pi + 2NAD^+ \xrightarrow{2ATP, 2ADP} 2C_3H_4O_3 + 2ATP + 2NADH_2 \]
5 MARKS QUESTIONS

1. Write the difference between cyclic and noncyclic photophosphorylation.

<table>
<thead>
<tr>
<th>Cyclic photophosphorylation</th>
<th>Noncyclic photophosphorylation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is associated with PS I</td>
<td>1. It is associated with both PS I and PS II.</td>
</tr>
<tr>
<td>2. The electron expelled from chlorophyll molecule is cycled back</td>
<td>2. The electrons are not cycled back but compensated by the electrons from photolysis of water.</td>
</tr>
<tr>
<td>3. Photolysis of water and evolution of oxygen do not take place.</td>
<td>3. Photolysis of water and evolution of oxygen take place.</td>
</tr>
<tr>
<td>4. Photophosphorylation takes place at two places.</td>
<td>4. Photophosphorylation takes place only at one place.</td>
</tr>
<tr>
<td>5. NADP is not reduced.</td>
<td>5. NADP + is reduced to NADPH₂.</td>
</tr>
</tbody>
</table>

2. What are the differences between C₃ and C₄ pathway?

<table>
<thead>
<tr>
<th>C₃ pathway</th>
<th>C₄ pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Photosynthesis occurs in mesophyll cells.</td>
<td>Photosynthesis occurs in mesophyll and bundle sheath cells.</td>
</tr>
<tr>
<td>2. The CO₂ molecule acceptor is RuBP.</td>
<td>The CO₂ acceptor molecule is phosphoenol pyruvate.</td>
</tr>
<tr>
<td>3. The first stable product is a 3C compound called 3 – PGA.</td>
<td>The first stable product is a 4C compound called OAA.</td>
</tr>
<tr>
<td>4. Photorespiration rate is high and leads to loss of fixed CO₂. It decreases CO₂ fixation rate.</td>
<td>Photorespiration is negligible and it is almost absent. Hence, it increases CO₂ fixation rate.</td>
</tr>
<tr>
<td>5. Optimum temperature is 20 to 25°C.</td>
<td>Optimum temperature is 30 to 45°C.</td>
</tr>
<tr>
<td>6. Examples of C₃ plants are rice, wheat and potato.</td>
<td>Examples of C₄ plants are maize, sugarcane, Tribulus and Amaranthus</td>
</tr>
</tbody>
</table>
3. **Write the Significance of pentose phosphate pathway**

- It provides alternative route for carbohydrate breakdown.
- It generates NADPH₂ molecules which are used as reductants in biosynthetic processes. Production of NADPH₂ is not linked to ATP generation in pentose phosphate pathway.
- It provides ribose sugar for the synthesis of nucleic acids.
- It provides erythrose phosphate required for the synthesis of aromatic compounds.
- It plays an important role in fixation of CO₂ in photosynthesis through Ru5P.

4. **Bring out the physiological effects of auxin.**

- Auxins are well known to promote elongation of stem and coleoptile.
- It promotes the growth by cell enlargement in stems.
- Suppression of growth in lateral bud by apical bud due to auxin produced by apical bud is termed as apical dominance.
- Auxin is responsible for initiation and promotion of cell division in cambium, which is responsible for the secondary growth and for the formation of callus.
- Auxin promotes growth of root only at extremely low concentrations. At higher concentrations, it always inhibits growth of root.
- Auxin prevents abscission.
- Seedless fruits are produced in tomato and apple, by external application of auxin on flowers. Such seedless fruits are called parthenocarpic fruits.
- 2,4-D Dichlorophenoxy acetic acid, a synthetic auxin is used to eradicate weeds in the field.

5. **Write the physiological effects of Gibberellin.**

- Gibberellins produce extraordinary elongation of stem.
  - Rosette plants exhibit excessive internodal growth when they are treated with gibberellin. This sudden elongation of stem followed by flowering is called bolting.
• Biennial plants could be made to flower without exposure to cold season in the first year itself, when they are treated with gibberellins.

• Formation of seedless fruits without fertilization can also be induced by gibberellin treatment in many plants. eg. Tomatoes, apples, cucumbers, etc.,

• Some of the light sensitive seeds can germinate by the treatment of gibberellic acid even in complete darkness. eg. barley,

• Gibberellin breaks dormancy in potato tubers.

6. **Write the physiological effects of Cytokinin.**

• The most important function of cytokinin is the promotion of cell division.

• In association with IAA, cytokinin initiates bud and root formation in callus tissue.

• External application of cytokinin promotes the growth of lateral buds even if the apical bud is intact.

• Cytokinin breaks the dormancy of many seeds and also promotes germination.

• Application of cytokinin delays the process of ageing in plants. This is also known as **Richmond Lang effect.**

7. **Write the physiological effects of Ethylene.**

• Ethylene prevents elongation of stem and root in longitudinal direction.

• Ethylene promotes positive geotropic growth of roots.

• Ethylene inhibits the growth of lateral buds in pea seedlings.

• Ethylene is involved in the ripening of fruits.

• Ethylene stimulates the formation of abscission zone in leaves, flowers and fruits. This causes leaves, flowers and fruits to shed prematurely.
• Flowering can be induced by application of ethylene in plants like pine apple and mango.
• Ethylene stimulates rooting of cuttings, initiation of lateral roots and growth of root hair.
• Ethylene is responsible for breaking the dormancy of buds and seeds.

8. **Write short notes on vernalization.**

The term vernalization was first introduced by a Russian scientist T.D. Lysenko in 1920. Many species, especially biennials and perennials are induced to flower at low temperature range of 1°C to 10°C. This is known as vernalization.

**Techniques of vernalization**

Seeds are allowed to germinate and subjected to cold treatment for varying period of time depending on the species. Germinated seeds after this treatment are allowed to dry for sometime and then sown.

**Devernalization**

Reversal of the effect of vernalization is called Devernalization. Subjecting the plants to higher temperature after a cold treatment brings about devernalization.

**Advantages**

(1) Crops can be produced earlier by vernalization.
(2) They can be cultivated in places where they naturally do not grow.
(3) Vernalization helps to accelerate the plant breeding.
10 MARKS QUESTIONS

1. Explain Dark reaction or Calvin Cycle or C₃ Cycle.

The reactions that catalyze the reduction of CO₂ to carbohydrates with the help of the ATP and NADPH₂ generated by the light reactions are called the dark reactions.
2. Explain C₄ path way or Hatch and Slack path way.

In C4 Plants like sugarcane the first formed stable product is a 4 carbon compound namely OAA. So it is called as C₄ Cycle.

<table>
<thead>
<tr>
<th>Air</th>
<th>Mesophyll cells</th>
<th>Bundle sheath cells</th>
<th>Vascular Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>CO₂</td>
<td>Aspartic acid (C₄)</td>
<td>2 (PGA)</td>
</tr>
<tr>
<td>PEP</td>
<td>ATP</td>
<td>OAA (C₃)</td>
<td>Calvin cycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Malic acid (C₃)</td>
<td>CO₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pyruvic acid (C₃)</td>
<td></td>
</tr>
</tbody>
</table>

3. Explain Photorespiration or C₂ cycle?

Respiration that occurs in photosynthetic tissues in the presence of light and results in increased rate of carbon dioxide evolution is called photorespiration or light respiration. Photorespiration involves three organelles – chloroplasts, peroxisomes and mitochondria.
4. What is Glycolysis? Explain the steps involved in Glycolysis (Draw flowchart Only)

The process by which the glucose (6C compound) is split into two molecules of pyruvic acid (3C compound) is called glycolysis.
5. Describe the sequences of reactions of Kreb’s Cycle or TCA Cycle or Citric acid Cycle?

The series of cyclic reactions involved in converting pyruvic acid to carbon dioxide and water in mitochondria is called Krebs cycle.
ONE MARK QUESTIONS

1. Artificial system of classification of plants was proposed by a Swedish botanist.
2. Which of the following classification is a sexual system of classification Artificia system.
3. The botanist who introduced binomial system is Gaspard Bauhin
4. The botanist who first followed binomial system is Carolus Linnaeus.
5. The standard size of herbarium sheets is 41 cm X 29 cm.
6. International Code of Botanical Nomenclature was adapted from 1978.
7. Genera plantarum of Bentham and Hooker was published in three volumes.
8. In Bentham and Hooker classification of plants, the present day orders were referred to by them as cohorts.
9. How many families were described by Bentham and Hooker in their classification? 202.
10. Plants having flowers with free petals come under polypetalae.
11. Inferae includes _____ orders and _____ families.
12. Thalamiflorae includes 6 orders and 34 families.
13. Which one of the following series includes the epigynous flowers? Inferae.
14. Thespisia populnea belongs to Malvaceae.
15. The family included under the series Unisexualae is Euphorbiaceae.
16. Anthers are monothecous in Malvaceae.
17. Binomial of lady's finger is Abelmoschus esculentus.
18. Malvaceae is placed in the series Thalamiflorae.
19. In Abelmoschus esculentus, the fruit is loculicidal capsule.
20. Solanaceae is placed under Polemoniales.
21. In which of the following plants the midrib and veins are found with yellowish spines Solanum xanthocarpum.
22. The carpels are obliquely placed in the members of **Solanaceae**.
23. *Ricinus communis* is a **shrub**.
24. Euphorbiaceae includes about **300 genera**.
25. An example of cladode is *Euphorbia tirucalli*.
26. In *Hevea brasiliensis*, the leaves are **trifoliately compound**.
27. The leaves and roots of ________ are used in the treatment of leprosy *Jatropha gossypifolia*.
28. The binomial name of ‘*Eli amanakku*’ is *Croton sparsiflorus*.
29. The characteristic inflorescence of Euphorbiaceae is **cyathium**.
30. ‘*The bird of paradise flower*’ refers to *Strelitzia reginae*.
31. The binomial name of Traveller’s palm is *Ravenala madagascariensis*.
32. The phyllotaxy in *Musa* is **spiral**.
33. In inflorescence in *Ravenala madagascariensis* is **compound cyme**.
34. The number of fertile stamens in *Ravenala madagascariensis* is **six**.
35. *Musaceae* is placed in the series **Epigynae**.
36. According to phylogenetic system, members of ________ of monocotyledons were highly advanced **Orchidaceae**.
37. In *Musa* the fruit is **Berry**.

2. **PLANT ANATOMY**

**ONE MARK QUESTIONS**

1. The change from meristematic tissue to permanent tissue is called **differentiation**.
2. The type of tissue presents in the petioles of banana and *Cana*, is **stellate parenchyma**.
3. The tissue generally present in all organs of plant is **parenchyma**.
4. The lamellar collenchyma is seen in the hypodermis of *Helianthus*.
5. The root hairs are produced from **trichoblasts**.
6. The osteosclereids are seen in **seed coat of Pisum**.
7. Bicollateral vascular bundles are seen in the members of **Cucurbitaceae**.
8. In xylem vessels, simple perforation plate is seen in the plant ______ **Mangifera**
9. The polyarch condition is found in **monocot root**.
10. The inner most layer of the cortex is **endodermis**.
11. When the xylem and the phloem lie in the same radius, the vascular bundle is called **Conjoint**
12. The vascular bundles are skull shaped in **monocot root**
13. The protoxylem lacuna is present in the vascular bundles of **monocot stem**.
14. The tetrarch condition is found in **Dicot root**.
15. Isobilateral leaf is present in **grass**.
16. The vascular bundle in the leaf is **collateral and closed**.
17. In leaf the epidermal cell involved in curling and flattening is **bulliform cells**.
20. _____ is a group of identical cells that are in a continuous state of division **Meristematic tissue**.
21. Which collenchyma is seen in the hypodermis of Helianthus. **lamellar**
22. Angular collenchymas is seen in the hypodermis of **Datura and Nicotiana**
23. Lacunate collenchymas is seen in the hypodermis **Ipomoea**.
24. The xylem fibres are also called **libriform fibres**.
25. The phloem fibres are also called **Bast fibres**.
26. Usually phloem parenchyma is absent in **Monocots**.
27. **Rhizodermis** is the outer most layer of root.
28. The Casparian strips are found in the endodermis of **dicot root**.
29. The passage cells are found in endodermis of **dicot root**.
30. In stem, protoxylem vessels are towards the center. This condition is known as **endarch**.
5. PLANT PHYSIOLOGY

**ONE MARK QUESTIONS**

1. Photosynthesis takes place in **chloroplasts**
2. During cyclic electron transport, which one of the following is produced **ATP only**
3. Which one of the following is a five carbon compound? **Ribose**
4. Which one of the following is a C4 plant? **Sugarcane**
5. The essential component for the formation of chlorophyll **Mg**
6. The pigment which is highly efficient in absorbing solar energy is **chlorophyll**
7. Which of the following bacterium oxidizes ammonia to nitrate **Nitrosomonas**
8. Which of the following is a total Root parasite **Cuscuta**
9. Which of the following wavelengths of light is most effective for Photosynthesis **400 nm to 700 nm**
10. Dark respiration is the function of **mitochondria**
11. The gas evolved during photosynthesis is **oxygen**
12. Dark reaction is also known as **Calvin cycle**
13. C4 pathway is otherwise known as **Hatch-Slack pathway**
14. Photorespiration is otherwise called as **C2 cycle**
15. An example for insectivorous plant is **Drosera**
16. Which of the following is regarded as primary pigment? **Chlorophyll -a**
17. The dark reactions of photosynthesis were discovered by **Melvin Calvin**
18. In C3 plants light reactions and dark reactions occur in **mesophyll cells**
19. In C3 pathway acceptor molecule of CO2 is **RuBP**
20. Vanda plant is a/an **epiphyte**
21. The photosynthetic pigments are located in **Thylakoid**
22. Which of the following is the common respiratory substrate? **Carbohydrates**
23. Complete oxidation of one molecule of glucose yields **38 ATP**
24. Respiratory quotient of glucose is **One**
25. Formation of ATP during electron transport chain is known as **oxidative phosphorylation**
25. The total amount of energy released from one molecule of glucose on oxidation is about **2900 kJ**

26. Which one of the following plant hormones was first discovered? **Auxin**

27. An example for synthetic auxin is **NAA**

28. Apical dominance is due to **auxin**.

29. In sigmoid curve the rapid growth phase is designated as **log phase**

30. Abscission is prevented by **Auxin**

31. Bakanae disease in paddy is caused by **gibberellic acid**

32. Closure of stomata is caused by **abscisic acid**

33. Which is a gaseous hormone **Ethylene**

34. The chemical used in the field to eradicate weeds is **2, 4 – D**

35. Which is the natural auxin found in higher plants? **IAA**

36. The response of a plant to the relative lengths of light and dark periods is known as **photoperiodism**

37. Which of the following is a long day plant? **Wheat**

38. Which of the following is a short day plant? **Tobacco**

1. **Draw the types of chromosomes.**

   ![Types of chromosomes](image)

   **Four Morphogenic types of chromosomes**

---

42
2. Draw the structure of chromosome

Structure of chromosome

3. Explain the structure of t-RNA

4. Structure of polytene, lamp brush chromosomes

1. The tRNA has a clover leaf like structure.
2. In 1965, R.W. Holley suggested the clover leaf model of tRNA.
3. It has four arms namely anticodon arm, D arm, T C arm and aminoacid acceptor arm.
4. The tRNA molecules are made up of 73 to 93 ribonucleotides.
5. In certain tRNAs in addition to these four arms an extra arm called variable arm
5. Write the differences between DNA and RNA.

<table>
<thead>
<tr>
<th>DNA</th>
<th>RNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It contains a deoxyribose.</td>
<td>1. It contains a ribose.</td>
</tr>
<tr>
<td>2. It contains adenine, guanine, cytosine and thymine</td>
<td>2. It contains adenine, guanine, cytosine and uracil.</td>
</tr>
<tr>
<td>3. It mostly occurs as a double-stranded helix.</td>
<td>3. It often occurs as a single stranded.</td>
</tr>
<tr>
<td>4. It is often much longer.</td>
<td>4. It is shorter.</td>
</tr>
<tr>
<td>5. It is more stable.</td>
<td>5. It is less stable.</td>
</tr>
</tbody>
</table>

I. Write an essay on SCP (Single Cell Protein)

1. The dried cells of microorganisms used as food or feed for animals and they are collectively known as Microbial proteins or Single Cell Protein.

2. Organisms used for SCP production
   - Algae: Chlorella, Spirulina and Chlamydomonas.
   - Fungi: Saccharomyces cerevisiae, Volvoriella and Agaricus campestris
   - Bacteria: Pseudomonas and Alkaligenes

3. Uses of SCP
   1. It is a rich source of protein (60 to 72 per cent), vitamins, amino acids, minerals and crude fibres.
   2. It is a popular health food. Nowadays, Spirulina tablets are prescribed as enriched vitamin for most people.
   3. It provides valuable protein-rich supplement in human diet.
   4. It lowers blood sugar level of diabetics due to the presence of gammalinolenic acid and prevents the accumulation of cholesterol in human body.
6 . BIOLOGY IN HUMAN WELFARE

5 Marks QUESTIONS

1. Write the aims of plant breeding?
   - Bringing wild food crops to cultivation.
   - Obtaining genes from desirable plants or related species
   - Introduction of plants from nearby regions or even from other countries for improvement of the crop. (eg. cauliflower, tomato)
   - By employing certain plant breeding techniques, new varieties are developed. eg. Maize.
   - Auto and Allopolyploid breeding.
   - By inducing mutations using physical and chemical mutagens.
   - Production of haploids by the application of plant tissue culture of anther and ovary.
   - Improvement of nutritional quality by genetic engineering (eg. Fortified rice - iron rich rice and carotene rich rice).
   - Development of disease, drought and environmental stress resistant varieties.

2. Bring out the Economic importance of Cotton.

- It is a cash crop.
- It gives three important products: fibre, food and cattle feed.
- Lint fibre is for clothing which is very much useful in the textile industries.
- Seed is used for extracting oil. This is also used as vanaspathi.
- Cotton flour prepared from the seed is used for bread and biscuit making.
- Cotton seed cake is used as a good organic manure.
- Fatty acids obtained from oil is used in the preparation of insecticide, fungicides and plastics, etc.
3. Bring out the Economic importance of Groundnut

- Groundnut oil is one of the important edible oils. It is extensively used in cookery as a salad oil. It is used for the manufacture of vanaspati.
- Groundnut kernel is rich and cheap source of vegetable protein. Kernels are eaten, fried and salted and added to a number of dishes.
- Peanut butter is prepared by grinding roasted and blanched kernels. It is nutritious.
- Groundnut oil is used to a limited extent in soap making.
- Oil is used as illuminant, lubricant.
- Oil cake is used as animal feed and organic manure.
- Groundnut shell is used in the manufacture of activated carbon.
- The groundnut cake is a good cattle feed. The plant after removing the pod, both dried and fresh is a good cattle feed.

4. Bring out the Economic importance of Rice.

- Parched rice (pori) is crisp to eat. It is sold either salted or unsalted.
- The flattened parboiled rice is known as flaked rice. Like corn flakes, it is a very good break fast food. Flaked rice is also used for preparing different kinds of food items.
- Sake is an important alcoholic beverage in Japan. Sake is prepared by the fermentation of rice.
- Bran is an important by-product of rice milling industry. It is used as a cattle feed.
- Bran oil is extracted either by expression in a hydraulic press or extraction with solvents. Bran oil is used as edible oil and for preparation of vanaspati, making soaps. It is also used in the textile industry, leather industry.
- Bran wax is a by-product in bran-oil extraction. It is used in chocolate industry and in the manufacture of lip-sticks.
- Paddy husk is used as fuel, in brick kilns. It is also used in brick making.
- Straw is used as cattle feed, in the manufacture of straw-boards and for making hats, ropes, mats, etc.

5. Bring out the Economic importance of Teak.

- Teak wood is durable and it is an important timber in the tropics. As the seasoned teak, timber does not shrink, crack or alter its shape, it is extensively used in making household furnitures.
- It is also used in ship building, boats, etc.
- It is used for interior decoration.
- It is used for the manufacture of boards.
6. **Explain the benefits of Biofertilizers?**

- Biofertilizers are easy to produce in abundance and are available at low cost to the marginal farmers.
- It increases soil fertility without causing any damage to the soil.
- Application of biofertilizers increases yield up to 45 per cent and the left over biofertilizers in the soil increases yield as long as the biofertilizer remains in the soil up to 3 to 4 years.
- Azolla, which is a biofertilizer amends the soil with organic matter.
- Cyanobacteria grow well both in acidic as well as in alkaline soils. The process of converting untenable, fallow land to cultivable soil is termed as **soil reclamation**. Blue green algae play a vital role in this conversion.
- Symbiotic nitrogen fixing Rhizobium is a biofertilizer. It adds 50 to 150 Kg of nitrogen to soil per hectare. Azatobacter and Azosporillum secrete antibiotics which act as biopesticides.
- Ectotrophic mycorrhiza, which acts as a biofertilizer, increases the surface area of the roots of host plants, so that more absorption of nutrients by the roots is made possible.

7. **Write short notes on microbes in medicine**

<table>
<thead>
<tr>
<th>Microbes</th>
<th>Antibiotics extracted</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillium notatum</td>
<td>Penicillin</td>
<td>It is effective against gram positive bacteria like pneumonia.</td>
</tr>
<tr>
<td>Streptomyces griseus</td>
<td>Streptomycin</td>
<td>It cures Urinary infections, tuberculosis, meningitis and pneumonia.</td>
</tr>
<tr>
<td>Streptomyces aureofaciens</td>
<td>Aureomycin</td>
<td>It cures osteomyelitis, Whooping cough and eye infections.</td>
</tr>
<tr>
<td>Streptomyces venezuelae</td>
<td>Chloromycetin</td>
<td>It kills bacillus bacteria and cures typhoid fever.</td>
</tr>
<tr>
<td>Aspergillus fumigatus</td>
<td>Antibiotic</td>
<td>It cures Typhoid and Dysentery</td>
</tr>
<tr>
<td>Bacillus subtilis</td>
<td>60 different antibiotic</td>
<td>-</td>
</tr>
<tr>
<td>Bacillus licheniformis</td>
<td>Bacitracin</td>
<td>To treat syphilis</td>
</tr>
</tbody>
</table>