SRINIVASA MATRIC. HR. SEC. SCHOOL
KOLLIDAM

BIO – BOTANY

3 marks Q & A

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BIOLOGY TEACHER

1. **TAXONOMY OF ANGIOSPERMS**

1. **What is a type specimen? | M-06 |**
   - 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.

2. **Define tautonym. Give example. | J-06, S-06, M-09, J-11, M-15 |**
   - If the generic and specific epithets are the same, it is called tautonym.
   - eg. Sassafras sassafras.

3. **Write the objectives of classification of plants. | M-07, J-08, M-11, S-11 |**
   - 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 relationship among the different groups of plants.

4. **Write three classes of seeded plants. | J-07, S-07, S-09, J-15 |**
   - Dicotyledonae,
   - Gymnospermae
   - Monocotyledonae

5. **What is ‘Binomial nomenclature’? Give example. | S-07, J-10, M-14 |**
   - The system of naming the plants on a scientific basis with first name as Generic and the second name as specific is binomial nomenclature.
   - Eg. Mangifera (Genus) indica (Species) = *Mangifera indica*

6. **Write the systematic position of potato family. | M-08 |**
   - Class : Dicotyledons
   - Sub-Class : Gamopetalae
   - Series : Bicarpellatae
   - Order : Polemoniales
   - Family : Solanaceae
   - Genus : Solanum
   - Species : Tuberosum

7. **Define Nomen ambigum. | S-08, J-12, S-12 |**
   - 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. **Write any three merits of Bentham and Hooker’s classification. | M-09 |**
   - It is the most natural system, based on actual examination of specimens.
   - The description is accurate and reliable.
   - 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.

9. **Explain author citation with example. | J-09, M-10, S-10, J-14 |**
   - Author is the person who publishes the description of any plant for the first time or giving a new name to a plant.
   - The name of plant should bear the author’s abbreviated name at the end of specific Epithet.
   - The name Linnaeus was abbreviated to L. or Linn., eg. *Malva sylvestris* Linn.

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**http://www.trbtpsc.com/2013/07/latest-12th-study-materials-2013.html**
10. Write any two merits and one demerit of Bentham and Hooker's classification. | J-10 |

Merits:
- It is the first natural system based on actual examination specimens.
- The description on plants is quite accurate and reliable.

Demerits:
- Several important floral characters have been neglected in this system.

11. What are the aims of bio systematics? | M-11 |
- To delimit the naturally occurring biotic community of plant species.
- To recognise the various groups as separate biosystematic categories such as Ecotypes, Ecospecies, Cenospecies and Comparium.

12. What are the alkaloids found in Tobacco? | M-12 |
- Alkaloids,
- Nicotine,
- Nor nicotine,
- Anabasine,

13. Write the sub-classes of Dicotyledonae. | M-13 |

Polypetalae, Gamopetale, Monochlamydae
- Sub-class 1: Polypetalae (It includes 3 series.) They are,
  a) Thalamiflorae
  b) Disciflorae
  c) Calyciflorae.
- Sub-class 2: Gamopetale: (It includes 3 series.) They are,
  a) Inferae
  b) Heteromerae
  c) Bicarpellatae.
- Sub-class 3: Monochlamydae:
  It includes flowers with single whorl of perianth. Flowers are incomplete.

- The flowers are hypogynous and ovary is superior with two carpels only.
- Bicarpeelatae includes 4 orders and 24 families.
- The family solanaceae is placed in the order polemoniales.

15. Write the systematic position of solanaceae. | S-13 |
- Class: Dicotyledons
- Sub-Class: Gamopetalae
- Series: Bicarpellatae
- Order: Polemoniales
- Family: Solanaceae

1. TAXONOMY OF ANGIOSPERMS

1. Draw floral diagram for female flower of Ricinus communis. | M-06 |
2. Name any three Binomials of medicinal plants in solanaceae. | J-06,S-14 |
   - **Atropa belladona**
   - **Datura stramonium**
   - **Solanum trilobatum**

3. What are the different types of inflorescences seen in Euphorbiaceae? Give example of each. | M-07, M-08 |
   - Panicle – **Ricinus communis**.
   - Solitary racemose – **Croton Sparciflorus**.
   - Catkin – **Acalypa indica**.
   - Cyathium - Euphorbia

4. Mention the fibre yielding plants of Malvaceae. | S-07, M-11 |
   - Gossypium barbadense - Egyptian cotton
   - Gossypium hirsutum - American cotton
   - Gossypium herbaceum - Cotton
   - Hibiscus cannabinus - Deccan hemp

5. Mention the binomials and uses of any three medicinal plants of Solanaceae. | J-08,S-10,S-11 |
   - Atropa belladonna - Roots- Atropine used for relieving muscular pain.
   - Datura stramonium - Leaves & flowers -Stramonium used to treat asthma & whooping cough.
   - Solanum trilobatum - Leaves, flowers,- berries Used to treat cough

6. What is atropine? | S-08,J-15 |
   - Roots of Atropa belladona yield powerful alkaloid called atropin which is used for relieving muscular pain.

7. Write the systematic position of Musaceae. | J-09,S-12 |
   - Class : Monocotyledonae
   - Series : Epigynae
   - Family : Musaceae

8. Write the botanical names of (a) Tapioca and (b) Castor. | S-09 |
   - Tapioca – Manihot esculenta.
   - Castor – Ricinus communis.

9. Write any three points comparing the androecium of Malvaceae and Solanaceae. | M-10 |
   - **Malvaceae** :
     - Numerous stamens
     - Anther is monothecous.
     - Anthers are transversely attached to filaments and transversely dehiscent.
   - **Solanaceae** :
     - There are only 5 stamens.
     - Anther is Dithecous.
     - Anthers usually basifixed or dorsifixed, dehiscing longitudinally or through apical pores

10. Mention the systematic position of Malvaceae. | J-11, J-14 |
    - Class : Diotyledonae
    - Sub-class : Polypetalae
    - Series : Thalamiflorae
    - Order : Malvales
    - Family : Malvaceae
11. What is cladode? Give an example. | M-12, J-13 |
   - In several species of Euphorbia, the stem is modified to perform photosynthesis.
   - This modified stem is called cladode and it resembles cactus.

12. What is monocarpic perennial? Give an example. | J-12 |
   - Monocarpic perennial is the one which produces flowers & fruits once during its life time.
   - Eg. Musa.

13. Mention the binomial of any three medicinal plants of Malvaceae. | M-13 |
   - Abutilon indicum Root and leaves used against fever.
   - Althea rosea Roots used for treating dysentery
   - Malva sylvestris Roots used for treating whooping cough

14. Write any three binomials of food plants of Malvaceae. | S-13 |
   - Abelmoschus esculentus - lady’s finger.
   - Hibiscus sabdariffa - a kind of pulichai.
   - Hibiscus cannabinus - pulichai keerai.

15. What is polygamous? Give an example. | M-14, S-14 |
   - The presence of staminate flowers, pistillate flowers and bisexual flowers in the same plant is called polygamous.
   - Eg. Musa

16. What is pseudostem? Give an example. | M-15 |
   - If apparent, unbranched, erect and aerial stem.
   - Formed by the long, stiff sheathy leaf bases which rolled around one another.
   - Eg. Musa.

2. PLANT ANATOMY

1. What are passage cells? Mention their function. | M-06, J-09, M-09, M-10, S-12, M-14, S-14, J-15 |
   - The endodermal cells, which are opposite to the protoxylem elements, are thin-walled without casparian strips. These cells are called passage cells.
   - Their function is to transport water and dissolved salts from the cortex to the xylem.

2. What are brachysclereids? Give example. | J-06 |
   - Isodiametric sclereids or brachy sclereids or stone cells
   - They are found in the bark, pith, cortex, hard endocarp and fleshy portions of many fruits.
   - Eg. Pulp of Pyrus.

3. Draw the diagram of bicollateral vascular bundle. | J-06, S-06, S-08, M-09, M-10, M-14 |
   - Bicollecteral: Eg. Cucurbitaceae and Solanaceae.
   - Two cambia are found with outer two zones of phloem and a middle xylem zone.

4. Different Sclereids from Fibres. | M-07, S-10 |
   - The sclereids are different from fibres in the following respects.
   - Sclereids are shorter whereas fibres are longer. Sclereids possess numerous pits as compared to the fibres.
5. Explain dorsiventral leaves with example. | J-07 |
- A leaf showing this differentiation in mesophyll is designated as dorsiventral.
- It is common in dicot leaves.

6. Write any three anatomical differences between monocot root and dicot root. | S-07, M-15 |

<table>
<thead>
<tr>
<th>MONOCOT ROOT</th>
<th>DICOT ROOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Xylem is polyarch</td>
<td>Xylem is usually tetrarch</td>
</tr>
<tr>
<td>2 Pith is usually large at the centre.</td>
<td>Pith is usually absent</td>
</tr>
<tr>
<td>3 Metaxylem vessels are generally circular in cross section</td>
<td>Metaxylem vessels are generally polygonal in Cross section.</td>
</tr>
<tr>
<td>4 Conjunctive tissue is sclerenchymatous in Maize</td>
<td>Conjunctive tissue is usually parenchymatous</td>
</tr>
<tr>
<td>5 Secondary growth is generally absent</td>
<td>Secondary growth is generally present</td>
</tr>
</tbody>
</table>

7. Write in three sentences about the mesophyll of dicot leaf. | M-08 |

- The entire tissue between the upper and lower epidermis is called the mesophyll.
- There are two regions in the mesophyll. They are palisade parenchyma and spongy parenchyma.
- Palisade parenchyma cells are seen beneath the upper epidermis. It consists of vertically elongated cylindrical cells in one or more layers.
- Palisade parenchyma cells contain more chloroplasts than the spongy parenchyma cells.
- Palisade parenchyma vertically elongated cylindrical cells.
- Spongy cells are irregularly shaped.

8. Bring out any three characteristics of meristematic cells. | J-08 |
- The meristematic cells may be round, oval, polygonal or rectangular in shape.
- They are closely arranged without intercellular spaces.
- They have dense cytoplasm with large nucleus.
- They have smaller vacuoles, which are scattered throughout the cytoplasm.
- Their cell walls are thin, elastic and made up of cellulose.

9. Define bundle sheath. | S-08 |
- In a monocot stem, Vascular bundles are scattered in the parenchymatous ground tissue.
- Each vascular bundle is surrounded by a sheath of sclerenchymatous fibres called bundle sheath.
- Vascular bundles are surrounded by a compact layer of parenchymatous cells called bundle sheath or border parenchyma.

10. Explain exarch and endarch xylem with examples. | M-09 |
- In roots, protoxylem vessels are present towards the periphery and the metaxylem vessels towards the centre. This arrangement of xylem is called **exarch**.
- In stem, protoxylem vessels are towards the centre, while metaxylem towards the periphery.
- This condition is known as **endarch**.
11. Define Eustele. | S-09, J-12, M-15 |
   - Vascular bundles are arranged in a ring around pith.
   - Eg: Dicot stem

12. What is a protoxylem lacuna? | J-10, S-13 |
   - In a mature bundle, the lowest protoxylem disintegrates and forms a cavity known as protoxylem lacuna.
   - Eg: Monocot stem

13. Write any three differences between the vascular bundles of Dicot stem and Monocot stem. | M-11 |

<table>
<thead>
<tr>
<th>VASCULAR BUNDLES IN DICOT STEM</th>
<th>VASCULAR BUNDLES IN MONOCOT STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vascular bundles are open.</td>
<td>Vascular bundles are closed.</td>
</tr>
<tr>
<td>2 Vascular bundles are arranged in a ring.</td>
<td>Vascular bundles are scattered in ground tissue.</td>
</tr>
<tr>
<td>3 Bundle cap is present.</td>
<td>Bundle sheath is present.</td>
</tr>
<tr>
<td>4 Protoxylem lacuna is absent</td>
<td>Protoxylem lacuna is present.</td>
</tr>
<tr>
<td>5 Phloem parenchyma is present.</td>
<td>Phloem parenchyma is absent.</td>
</tr>
</tbody>
</table>

14. What is a mesophyll? | J-11, M-12 |
   - In leaf, the ground tissue that lies between the epidermal layers (Upper and Lower epidermis) is called mesophyll.

15. Write three differences between the Palisade and Spongy parenchyma. | J-13, S-11 |

<table>
<thead>
<tr>
<th>PALISADE PARENCHYMA</th>
<th>SPONGY PARENCHYMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 They are vertically elongated &amp; are arranged</td>
<td>They are irregular and loosely arranged</td>
</tr>
<tr>
<td>2 with without inter cellular spaces</td>
<td>numerous air spaces.</td>
</tr>
<tr>
<td>3 Contain more chloroplasts.</td>
<td>Contain lesser number of chloroplast</td>
</tr>
<tr>
<td>4 Main function is photosynthesis</td>
<td>Main function is exchange of gases.</td>
</tr>
</tbody>
</table>

16. Write any three functions of epidermal tissue system. | M-13 |
   - Checks excessive loss of water due to the presence of cuticle.
   - Protects the underlying tissues.
   - Stomata involve in transpiration and gaseous exchange.
   - Trichomes are also helpful in the dispersal of seeds & fruits.
   - Root hairs absorb water and mineral salts from the soil.

17. What are trichomes? | J-14 |
   - The unicellular or multicellular appendages that originate from the epidermal cells are called richomes.
   - Trichomes may be branched or unbranched.

18. Draw Brachysclereids and label the parts. | M-06, J-09, S-09, J-10, M-12 |

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20. Draw diagram for Lacunate collenchyma and label its parts. | S-06 |

![Lacunate collenchyma](image1)

21. Draw diagram for angular collenchyma and label its parts. | M-07, J-12, J-13 |

![Angular collenchyma](image2)

22. Draw any three types of secondary wall thickenings in tracheids. | J-07 |

![Secondary wall thickenings](image3)

23. Draw the parenchyma tissue and label its parts. | S-07, J-11 |

![Parenchyma tissue](image4)

24. Draw the ground plan for T.S of sunflower stem and label the parts. | M-08 |

![Ts of sunflower stem](image5)
25. Draw the ground plan for T.S of dicot root and label its parts. | J-08, S-10

![Ground plan of dicot root](image)

26. Describe any two types of collenchyma. | M-11 |

Lamellar Collenchyma
- only the tangential walls of collenchyma are thickened and the radial walls are devoid of thickening.
- Hypodermis of Helianthus

Angular Collenchyma
- The cell walls of collenchyma are thickened at their angles.
- Hypodermis of Datura and Nicotiana,

Lacunate Collenchyma
- The cell wall thickening materials are deposited on the walls bordering the intercellular spaces.
- Hypodermis of Ipomoea,

27. What are lateral meristems? | S-11 |
The mertistems that is present along the longitudinal axis of stem and root is called lateral meristems

28. Draw and label the amphicribral cascular bundle. | S-12 |

![Amphicribral vascular bundle](image)

29. Draw and label the parts of xylem vessel. | M-13,S-14 |

![Xylem vessel](image)

30. Draw and label the structure of phloem fibre. | S-13 |
31. What is meristematic tissue? | J-15 |
- A Meristematic tissue is a group of identical cells that are in a continuous state of division.
- Some cells produced by meristematic tissue stop dividing and acquire certain changes to become permanent tissues of the plant.
- This change from meristematic to permanent tissue is called differentiation.

3. CELL BIOLOGY AND GENETICS
1. Draw the structure of chromosome and label its parts. | J-06,S-06,M-07,S-09,S-10,M-14,J-15 |

2. Draw the structure of t-RNA and label the parts. | M-07, S-07,M-08,M-09,M-11, S-11 |

3. Draw different types of chromosomes based on shape and position of centromere. | M-06,J-10,S-10 |

Telocentric  Acrocentric  Sub-metacentric  Metacentric

Fig. 3.2 Four morphogenetic types of chromosomes
4. Draw and label the lampbrush chromosome.  | S-08, J-11, M-13, J-14 |

![Lamp brush chromosome](image)

*Fig. 3.3. Special types of chromosomes*

5. Draw and label the polytene chromosome.  | J-08,J-09,M-11,J-12,S-13,M-15 |

![Polytene chromosome](image)

### 4. BIOTECHNOLOGY

1. How do bacteria protect themselves from the attack of viruses?  | M-06 |
   - All bacteria produce at least one type of restriction enzymes.
   - They help in the very survival of the bacterial species against the invading bacterial viruses.
   - The restriction enzymes can chop up and render harmless invading viral DNA

2. Name the enzymes involved in the making of a DNA hybrid.  | J-06, J-13 |
   - Restriction endonuclease
   - DNA Ligase.

3. List the importance tissue culture centres in India.  | S-06 |
   - IARI : Indian Agricultural Research Institute-New Delhi.
   - BARC : Baba Atomic Research Centre-Mumbai.
   - CIMAP : Central Institute of Medicinal and Aromatic plants-Lucknow, U.P.
   - MSSRI : Dr.M.S. Swaminathan Research Institute-Chennai.

4. Mention the names of any three algae used for SCP production.  | M-07 |
   - Chlorella,
   - Spirulina
   - Chlamydomonas.

5. List down any three genetically engineered products and their functions.  | J-07 |

<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>FUNCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Interferon</td>
<td>Helps the cells resist viruses</td>
</tr>
<tr>
<td>2 Interleukin</td>
<td>Stimulates the proliferation of WBCs that take part in immunity.</td>
</tr>
<tr>
<td>3 Insulin</td>
<td>Treats diabetes</td>
</tr>
<tr>
<td>4 Human growth hormone</td>
<td>Promotes growth in children with hypopituitarism</td>
</tr>
<tr>
<td>5 Renin inhibitors</td>
<td>Decreases blood pressure.</td>
</tr>
</tbody>
</table>
6. Write any three Transgenic dicotyledonous plants. | M-13, S-14 |
   - Nicotiana tabacum
   - Helianthus annuus
   - Beta vulgaris
   - Solanum tuberosum
   - Glycine max
   - Gossypium hirsutum

7. What is restriction endonuclease? | M-08 |
   - Restriction Endonucleases discovered in 1970.
   - They involved in cutting DNA at its specific site consisting a sequence of nucleotides.
   - They are called Molecular Scissors.

8. Write any three benefits obtained by the release of genetically modified organisms into the environment. | J-08 |
   - Enzymes needed for food Industry are produced.
   - Microbes with improved efficiency of fermentation are obtained.
   - Microbes involve in diary Industry are improved.

9. Write any three monocot transgenic plants. | M-09, J-15 |
   - Asparagus species.
   - Zea mays
   - Oryza sativa
   - Avena sativa

10. What is Inoculation? | M-09 |
    - Transfer of explant (root, stem, leaf, etc.) on to a culture medium is called inoculation.
    - The inoculation is carried out under aseptic condition for which an apparatus called laminar air flow chamber is used.

11. What is SCP? Give an example. | S-13 |
    - The microorganisms which are being used to prepare food and cattle feed like bacteria, yeasts, filamentous fungi and mosses etc. constitute single cell protein.
    - Eg. Algae like chlorella.
    - The dried cells of microorganisms used as food or feed for animals and they are collectively known as Microbial proteins.
    - This term was replaced by a new term „Single Cel Protein“.
    - Eg. Algae like chlorella.

12. What is splicing? | S-12 |
    - Using restriction endonuclease, the DNA of the vector is cut into fragments
    - Using DNA ligase, the DNA fragments of donor and vector are joined together.
    - This process is called splicing.

13. What are transgenic plants? Give any two examples. | J-10 |
    - Genetically engineered plant species are called transgenic plants.
    - These plants were made to resist insects, pests, viruses, herbicides through incorporation of foreign gene into DNA of host plants.
    - Eg. Oryza sativa – Transgenic monocot plant
    - Eg. Beta vulgaris – Transgenic dicot plant

14. What is the importances of Escherichia coli in bio-technology? | S-10 |
    - Escherichia coli has become one of the potentially most powerful tools known to science in genetic manipulation.

The extra chromosomal circular DNA found in the cytoplasm of Escherichia coli is called plasmid.
- The plasmids are the most suitable vectors.

15. What is PEG? Write its role. | M-11 |
- Poly Ethylene Glyco is a fusogenic agent.
- The isolated parent protoplasts are fused with a fusogenic agent.
- It is followed by nuclear fusion and results in a somatic hybrid.

16. What is morphogenesis? Describe the types. | S-11 |
- Formation of new organs from the callus under the influence of auxin and cytokinin is called morphogenesis.
  Organogenesis:
- Formation of new organs such as shoot and root is known as organogenesis.
- The development of shoot from the callus is called caulogenesis and formation of root is called rhizogenesis.
  Embryogenesis:
- Formation of embryos from the callus is called embryogenesis.
- These embryos arise from somatic callus tissue and are called somatic embryos or somaclonal embryos.

17. What is meant by bio-remediation. | M-12 |
- Bio-remediation is the use of living micro-organisms to degrade enviromental pollutants or prevent pollution.
- The contaminated sites are restored and future pollution is prevented.
- Eg: Superbug

18. Define totipotency. | J-12 |
- The inherent potential of any living plant cell to develop into entire organism is called totipotency.
- This is unique to plant cells.

19. Write any three organisms for the production of Single Cell Protein. | M-14 |
- Algae-Chlorella, Spirulina, Chlamydomonas.
- Fungi-Saccharomyces,Cerevisae, Volvoriella, Agaricus
- Bacteria-Pseudomonas, Alkaligenes

20. What is sterilization? | J-14 |
- Sterilization is the technique employed to get rid of the microbes such as bacteria and fungi in the culture medium and plant tissues.
- The culture medium can be sterilized by keeping it an autoclave.

21. Mention any three culture media used in plant tissue culture. | M-15 |
- Murashige and Skoog Medium or M.S.Medium.
- Gamborg Medium or B5 Medium.
- White Medium or W Medium.
- Nitsch Medium.

5. PLANT PHYSIOLOGY

1. What is photoysis of water? | M-06, J-06, S-06, S-09, M-11, J-12, J-15 |
- During non-cyclic photophosphorylation the PS II is in oxidise state.
- It creates a potential to split water molecules to protons, electrons and oxygen.
- The light dependent splitting of water molecules is called photolysis of water.
Manganese, calcium and chloride ions play prominent roles in the photolysis of water.

\[ CO_2 + 2H_2O \xrightarrow{\text{Solar energy} \atop \text{Chlorophyll}} (CH_2O)_n + H_2O + O_2 \]

2. State the conditions under which cyclic photophosphorylation occurs. [J-07, J-09, M-10, M-15]

Under the condition of:
- PS I only remains active
- Photolysis of water does not take place.
- Requirement of ATP is more.
- Non availability of NADP+ the cyclic photophosphorylation takes place.

3. What is Photophosphorylation? [M-08]
- Process of ATP formation from ADP in the presence of light in chloroplast it called photophosphorylation.

4. List the photosynthetic pigments. [M-09]
- Chlorophyl "a",
- Chlorophyl "b",
- Carotenoids,
- Xanthophyll
- Phycobilins.

5. Write the overall reaction of photosynthesis (equation). [J-10, S-14]

\[ CO_2 + 2H_2O \xrightarrow{\text{Solar energy} \atop \text{Chlorophyll}} (CH_2O)_n + H_2O + O_2 \]

6. Define chemosynthesis. [S-13]
- Chemosynthesis is a process by which certain organisms synthesize carbohydrates by using energy obtained by the oxidation of inorganic substances.
- Eg: Nitrosomonas

7. Write three differences between C3 and C4 pathway. [S-11]

<table>
<thead>
<tr>
<th></th>
<th>C3 PATHWAY</th>
<th>C4 PATHWAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Photosynthesis occurs in mesophyll cells</td>
<td>Photosynthesis occurs in mesophyll and bundle sheath cells.</td>
</tr>
<tr>
<td>2</td>
<td>The CO2 molecule acceptor is RuBP</td>
<td>The CO2 acceptor molecule is phosphoenol pyruvate</td>
</tr>
<tr>
<td>3</td>
<td>The first stable product is a 3C compound called OAA</td>
<td>The first stable product is a 4C compound. called 3 – PGA.</td>
</tr>
<tr>
<td>4</td>
<td>Photorespiration rate is high and leads to loss of fixed CO2. It decreases CO2 fixation</td>
<td>Photorespiration is negligible and it is almost absent Hence, it increases CO2 fixation rate.</td>
</tr>
<tr>
<td>5</td>
<td>Optimum temperature is 20 to 25°C.</td>
<td>Optimum temperature is 30 to 45°C.</td>
</tr>
<tr>
<td>6</td>
<td>Examples of C3 plants are rice, wheat</td>
<td>Examples of C4 plants are maize, sugarcane, Tribuluspotato, and Amaranthus</td>
</tr>
</tbody>
</table>
8. Write any three significances of pentose phosphate pathway. | M-12 |
   - It provides alternative route for carbohydrate breakdown.
   - It generates NADPH2 molecules which are used as reductants in biosynthetic processes.
   - 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.

   - The granal lamella where the photosynthetic pigments are aggregated to perform photosynthetic activities is called active ventre.

10. Write any three differences between cyclic and noncyclic photophosphorylation. | M-14 |

<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>It is associated with both PS I and PS II.</td>
</tr>
<tr>
<td>2 Photolysis of water and evolution of oxygen</td>
<td>Photolysis of water and evolution of oxygen take do not take place</td>
</tr>
<tr>
<td>3 Photophosphorylation takes place two</td>
<td>Photophosphorylation takes place only at one place</td>
</tr>
<tr>
<td>4 NADP+ is not reduced</td>
<td>NADP+ is reduced to NADPH2</td>
</tr>
</tbody>
</table>

11. Name the enzymes involved in dark reactions. | J-14 |
   - RuBP carboxylase
   - PGA Kinase
   - Glycerinaldehyde-3-phosphate dehydrogenase.

5. PLANT PHYSIOLOGY

1. Explain respiratory quotient. | J-06 |
   - It is defined as the ratio between the volume of CO2 given out and O2 consumed during respiration.
   - This value depends upon the nature of the respiratory substrate and its rate of oxidation.

3. The respiratory quotient of a carbohydrate molecule is one. How? | M-07 |
   - Respiratory quotient of a carbohydrate
     \[ C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy \]
     \[ \text{Respiratory quotient of glucose} = \frac{6 \text{ moles of } CO_2}{6 \text{ moles of } O_2} = 1 \]

4. Write the advantage of Vernalization. | M-14 |
   - Crops can be produced earlier.
   - Crops can be cultivated in places where they naturally do not grow.
   - It helps to accelerate the plant breeding.

5. Is it possible to shorten the time of crop maturity? Support Your answer. | S-07 |
   - Yes, it is possible, crops are treated by vernalization growing and maturing earlier than that of normal life time.

6. Respiratory quotient of glucose in anaerobic respiration is infinity. Give reasons. | M-08 |

In anaerobic respiration, carbon dioxide is evolved but oxygen is not consumed. Therefore, the respiratory quotient in such case is infinity. For example,

\[ C_6H_{12}O_6 \xrightarrow{zymase} 2C_2H_5OH + 2CO_2 + \text{Energy} \]

\[ \text{Glucose} \quad \text{Ethanol} \]

\[ \text{Respiratory quotient of glucose in anaerobic respiration} = \frac{2 \text{ moles of } \text{CO}_2}{\text{zero moles of } \text{O}_2} = \infty \text{ (infinity)} \]

7. Draw and label the structure of ATP. | J-14 |

![ATP Structure](image)

8. Write about the structure of ATP. | J-08 |

- ATP (Adenosine Triphosphate) is called as energy currency of the cell.
- The energy released during respiration is transformed into usable form of energy as ATP.
- ATP acts as carrier of free energy between energy yielding and energy requiring reactions of the cell.
- It is a nucleotide consisting of adenine, ribose sugar and three phosphate groups.
- It is an energy rich compound and contains two high energy terminal bonds.
- A large amount of free energy is liberated, when these bonds are broken by hydrolysis.

9. What is vernalization? | S-08 |

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

10. Write the chain of electron carriers in electron transport system. | M-09 |

- NAD+
- FAD+
- FMN
- CoQ
- Cytochromes

11. What are the three stages of sigmoid curve? | S-09, J-15 |

- Lag phase.
- Log phase.
- Steady State Phase.

12. Write the role of following enzymes in respiration:

   a) Aldolase  b) Succinyl CoA synthetase. | M-11 |

   a) Role of Aldolase:

   - Fructose 1, 6- bisphosphate is cleaved by the enzyme aldolase to 2 molecules of 3C compounds dihydroxy acetone phosphate (DHAP) and glyceraldehyde 3-phosphate.
   - These two trioses are isomers.
b) Role of Succinyl CoA synthetase
   - The succinyl Co-A is hydrolysed to succinic acid in the presence of succinyl Co-A synthetase.
   - In this reaction, ADP is phosphorylated to ATP.
   - This is called substrate level phosphorylation.

13. Write two physiological effects of Abscisic acid. | J-11 |
   - Abscisic acid acts as growth inhibitor and induces bud dormancy in a variety of plants.
   - ABA is a powerful growth inhibitor. It causes 50% inhibition of growth of oat seedlings.
   - ABA is an hormone that stimulates abscission.
   - ABA controls geotropic responses of roots. It stimulates positive geotropism in roots.
   - Abscisic acid causes closure of stomata.

14. What is an energy currency of a cell? Why is it called so? | S-11 |
   - ATP (Adenosine Tri Phosphate) is called as energy currency of the cell.
   - The energy released during respiration is transformed into usable form of energy as ATP.
   - ATP acts as carrier of free energy between energy yielding and energy requiring reactions of the cell.
   - It is a nucleotide consisting of adenine, ribose sugar and three phosphate groups.
   - It is an energy rich compound and contains two high energy terminal bonds.
   - A large amount of free energy is liberated, when these bonds are broken by hydrolysis.

15. What is Kreb’s cycle? | J-13 |
   - The series of cyclic reactions involved in converting pyruvic acid to carbon-di-oxide and water in mitochondria is called Kreb’s cycle.
   - It is also known as citric acid cycle or tricarboxylic acid cycle (TCA cycle).

16. Write the overall reaction of glycolysis. | M-14 |
   \[ C_6H_{12}O_6 + 2ADP + 2Pi + 2NAD^+ \rightarrow 2C_3H_4O_3 + 2ATP + 2NADH_2 \]

17. Write the overall equation for respiration. | M-15 |
   - C6H12O6+6O2→6CO2+6H2O+Energy (2900kJ)
   - Glucose in the presence of oxygen gives out carbon dioxide and water releasing 2900KJ energy.

5. PLANT PHYSIOLOGY

1. What is Richmond - Lang effect? | J-11 |
   - Cytokinin delays the process of ageing in plants.
   - This is known as Richmond Lang effect.

2. Define Bolting. | S-08 |
   - Rosette plants usually show reduced internodal growth.
   - These plants exhibit excessive internodal growth when they are treated with gibberelline.
   - This sudden elongation of stem followed by flowering is called bolting.

3. Explain long day plants and short day plants with examples. | S-06 |
   - The plants requiring light for a shorter period than their critical period are known as short day plants.
   - Ex. Tobacco & Chrysanthemum
   - The plants requiring longer exposure to light than their critical period are known as...
4. Write any three physiological effects of Gibberellin. | M-07 |
   - Gibberellins produce extraordinary elongation of stem through the cell division and cell elongation.
   - Many biennials usually flower during the second year of their growth.
   - Formation of seedless fruits without fertilization can also be induced.
   - One of the most striking effects of the gibberellins is the reversal of dwarfism in many genetically dwarf plants.
   - The sudden elongation of stem followed by flowering is called bolting.

5. Mention any three physiological effects cytokinin. | J-07 |
   - It promotes cell division.
   - In association with IAA it initiates bud and root formation in callus tissue.
   - It breaks the dormancy of many seeds and also it promotes seed germination.
   - It promotes the growth of lateral buds even if the apical bud is intact.
   - It breaks the dormancy of many seeds and also promotes germination.
   - It delays the process of ageing in plants. This is known as Richmond Lang effect.

6. What are insectivorous plants? Give an example. | M-08 |
   - Though insectivorous plants are capable of manufacturing carbohydrates by photosynthesis, they are not able to synthesize enough proteins due to the deficiency of nitrogen.
   - They overcome this deficiency by catching small insects and digesting them.
   - Their leaves are modified in various ways for this purpose. Such plants are called insectivorous plants. Eg. Drosera.

7. What are dimorphic chloroplasts? | J-08 |
   - The C4 plants contain dimorphic chloroplasts
   - Chloroplasts in mesophyll cells are granal (with grana)
   - whereas in bundle sheath chloroplasts are agranal (without grana).

8. Define fermentation. | S-12 |
   - Fermentation literally means a chemical change accompanied by effervescence.
   - The anaerobic breakdown of glucose to carbon dioxide and ethanol is a form of respiration referred to fermentation.

9. Explain total parasite plant with an example. | J-09 |
   - Some plants completely lack chlorophyll and do not grow in the soil.
   - Therefore, it is totally dependent on the host stem for organic food materials, water and minerals.
   - Eg. Cuscuta.

10. Write the role of aconitase in Kreb's cycle. | J-09 |
    - Citric acid is dehydrated to form cis-aconitic acid in the presence of aconitase.
    - The same enzyme aconitase catalyzes the formation of isocitric acid from cis-aconitic acid by the addition of a molecule of water.

11. What is C2 cycle? | S-09 |
    - Respiration that occurs in photosynthetic tissues in the presence of light and results in increased rate of carbon dioxide evolution is called photorespiration or C2 cycle.
or light respiration.

12. Define **Growth inhibitors. Give an example.** | J-10, S-10 |
   - Some organic substances produced in the plant inhibit the plant growth.
   - These substances are called growth inhibitors.
   - Eg. Ethylene is a potent inhibitor of bud growth.
   - They inhibit the elongation in roots, stems and leaves.
   - ABA inhibits lateral bud growth in tomato.

13. What is **apical dominance?** | S-11, J-15 |
   - Suppression of growth in lateral bud by apical bud due to auxin produced by apical bud is termed as **apical dominance.**

14. What is **short day plant? Give an example.** | J-12 |
   - The plants requiring light for a shorter period than their critical period are known as short day plants.
   - Ex. Tobacco & Chrysanthemum

15. What are called **long day plants? Give an example.** | J-13 |
   - The plants requiring longer exposure to light than their critical period are known as long day plants.
   - Eg. Wheat & Oats

16. Write the **advantage of Vernalization.** | M-14 |
   - Crops can be produced earlier.
   - Crops can be cultivated in places where they naturally do not grow.
   - It helps to accelerate the plant breeding.

17. Define **photoperiodism.** | S-14, M-15 |
   - The response of a plant to the relative lengths of light and dark periods is known as **photoperiodism.**
   - In plants, most significant photoperiodic response is the initiation of flowering.

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6. **BIOLOGY IN HUMAN WELFARE**

1. What is **heterosis?** | M-06, J-10, S-11, J-12, J-14, S-14 |
   - The superiority of the F1 hybrid in performance over its parents is called heterosis or hybrid vigour.
   - Vigour refers to increase in growth, yield, resistance to diseases, pests and drought.

2. Mention any two unique facets of **Bio-patency.** | J-06 |
   - Intellectual Property Protection (IPP) :
   - Intellectual Property Rights (IPR)

3. What are **biomedicines? Give an example.** | S-06, J-09, S-09, S-12 |
   - Medicinally valuable compounds obtained from the medicinal plants are called "biomedicines".
   - Eg: alkaloids, glycosides, corticosteroids, essential oils, etc.

4. What are **edible interferons?** | M-07 |
   - Interferons are the substances made of proteins and are anti-viral in nature.
   - Scientists have successfully produced transgenic tobacco and maize plants that secrete human interferons.

5. Write about **pureline selection.** | J-07 |
A collection of plants obtained as a result of repeated self-pollination from a single homozygous individual.
- Products obtained by this have more homozygosity with respect to all genes.
- New genotypes are never created by this method.

6. What is humulin? | M-09, S-07, S-10, M-14 |
- Through genetic manipulation, and introduction of human gene for insulin production, the bacterium E.coli is articulated to produce human insulin called humulin.

7. What is soil reclamation? | M-08, S-13 |
- The process of converting untenable, fallow land to cultivable soil is termed as soil reclamation.
- Eg. Bluegreen algae play a vital role in soil reclamation.
- Cyanobacteria grow well both in acidic as well as in alkaline soils.
- Since, cyanobacteria are potent neutralizers, they help in the neutralization of soil.

8. What is Bio-Piracy? | J-08, M-11, M-12 |
- The clandestine exploitation and utilization of bio-resources from a country by several organizations and multinational companies without proper authorization is known as Bio-Piracy.

9. Define clonal selection. | S-08 |
- Corps like sugarcane, potato, tea, banana and certain species of grasses are asexually propagated and produce very poor seeds.
- Based on their phenotypic appearance, the method of clonal selection is employed to select improved variety from a mixed population (clones).
- Selected plants are multiplied through vegetative propagation to give rise to a clone.
- The genotype of a clone remains unchanged for a long period of time.

10. What is rice bran oil? Write any two uses of it. | M-10 |
- Rice Bran oil is extracted either by expression in a hydraulic press or extra-ction with solvents.
- Rice Bran oil is used as edible oil and for preparation of vanaspathi, making soaps.
- It is also used in the textile industry, leather industry.
- Recently, from the husk of paddy, a cooking (rice bran oil) oil is extracted.
- Now, bio-diesel is obtained from rice bran oil.

11. What are biopesticides? | J-11 |
- Biological agents that are used for control of insects, weeds and pathogens produced from living organisms are called biopesticides.
- Micro organisms such as viruses, bacteria, fungi, protozoa and mites may be used as bio-pesticides.

12. What are Biofertilizers? Give an example. | M-13 |
- The „Biofertilizer” denotes all the nutrient inputs of biological origin for plant growth.
- Bacteria and cyanobacteria are known to fix atmospheric nitrogen and are known as Biofertilizers.
- The term „biofertilizer” denotes all the nutrient inputs of biological origin for plant growth.
13. Write any three economic importance of cotton. | J-13 |
- 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.

14. Name the components found in Bordeaux mixture. | M-15 |
- Copper sulphate - 9 Kgs.
- Quick lime - 9 Kgs.
- Water - 250 litres.

15. List out any three medicinal uses of aegle marmelos. | J-15 |
- Unripe fruit is used to treat problems of stomach indigestion.
- Kills intestinal parasites.
- Used also to cure chronic diarrhoea and dysentery.
- Used as a tonic for the betterment of heart and brain.

BEST WISHES

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