

## 12th Bio-Botany One Mark Study Material

### 1. Asexual and sexual Reproduction in plants.

1. Example for pollinium \_\_\_\_\_ ( **Calotropis** )
2. In anther wall which layer hygroscopic nature \_\_\_\_\_ ( **Endothecium** )
3. The stomium are Present in \_\_\_\_\_ layer of the anther wall ( **Endothecium** )
4. \_\_\_\_\_ Crushed during maturity, ( **middle layer** )
5. Vascular tissue are present in \_\_\_\_\_ region of Mature anther. ( **connective tissue** )
6. Example for Orthotropous \_\_\_\_\_ ( **Pipraceae** )  
 Example for Anatroous \_\_\_\_\_ ( **Monocot, dicot** )  
 Example for Campylotropous \_\_\_\_\_ ( **Leguminosae** )  
 Example for Amphitropous \_\_\_\_\_ ( **Alismataceae** )  
 Example for Circinotropous \_\_\_\_\_ ( **Cactaceae** )  
 Example for Hemianatroous \_\_\_\_\_ **Prisenlacece**  
 Example for monosporic embryosac \_\_\_\_\_ ( **polygonum** )  
 Example for Bisporic embryosac \_\_\_\_\_ ( **Allium** )  
 Example for Tetrasporic embryosac \_\_\_\_\_ ( **peperomin** )
7. Cleistogamy pollination \_\_\_\_\_ ( **Commelina, Viola, Oxalis** )
8. Homogamy \_\_\_\_\_ ( **Mirabilis jalapa, Catharanthus roseus** )
9. monocious \_\_\_\_\_ ( **Maize** )
10. diocious \_\_\_\_\_ ( **Borassus, Carica, phoenix** )
11. Protandry \_\_\_\_\_ ( **Helianthus, Clerodendran** )
12. Protogyny \_\_\_\_\_ ( **Scrophularia nodosa, Aristolochia bracteata** )
13. Herkogamy \_\_\_\_\_ ( **Gloriosa superba, Hibiscus** )
14. Distily \_\_\_\_\_ ( **Primula** )
15. Tristyly \_\_\_\_\_ ( **Lythrum** )
16. self sterility \_\_\_\_\_ ( **Abutilon, passiflora,** )
17. Anemophily \_\_\_\_\_ ( **grasses, sugarcane bamboo Coconut, palm, maize** )
18. Hydrophily \_\_\_\_\_ ( **Vallisneria, Hydrilla** )
19. Epi hydrophily \_\_\_\_\_ ( **Vallisneria spiralis, Elodea** )
20. Hypohydrophily \_\_\_\_\_ ( **zostera marina, Ceratophyllum** )
21. Ornithophily \_\_\_\_\_ ( **Erythrina Bombox ,etc.** )
22. Cheirpterophilly \_\_\_\_\_ ( **kigelia africana, Adansonia digitata** )
23. Malacophily \_\_\_\_\_ ( **Araceae,** )
24. Nuclear endosperm \_\_\_\_\_ ( **Coccinia, Capsella, Arachis** )  
 Cellular endosperm \_\_\_\_\_ ( **Adoxa, Helianthus Scoparia,** )  
 Ruminant endosperm \_\_\_\_\_ ( **Araca Catechu, passiflora, Myristica** )  
 Helobial endosperm \_\_\_\_\_ ( **Hydrilla, Vallisnaria** )
25. Endospermou seed \_\_\_\_\_ ( **wheat, maize, barly, sunflower** )  
 Non - Endospermou seed \_\_\_\_\_ ( **Bean, Mango, Orchids, Cucurbits** )
26. Apomixis introduced by \_\_\_\_\_ ( **Wrinkler** )
27. Agamospermy \_\_\_\_\_ ( **without meiosis and syngamy** )
28. Adventive embryony \_\_\_\_\_ ( **Citrus, Mangifera** )
29. Diplospory \_\_\_\_\_ ( **Eupatorium Aerva** )
30. Apospory \_\_\_\_\_ ( **Hieracium and Parthenium** )
31. Cleavage polyembryony \_\_\_\_\_ ( **Orchids** )
32. Parthenocarpic fruit \_\_\_\_\_ ( **Banana, Grapes, Papaya** )

### 2. Classical Genetics

1. Discontinuous variation \_\_\_\_\_ ( **style length in Primula** )  
 Continuous variation \_\_\_\_\_ ( **Human Height, skin Colour** )
2. Monohybrid phenotypic ratio - **3:1**  
 Monohybrid genotypic ratio - **1:2:1**
3. **Pea Gene A** - is responsible for the production of **anthocyanin pigment**.
4. Tall pea plants- one allele (Le) - formation of gibberellins (GA1).
5. Dihybrid Cross Phenotypic Ratio **9:3:3:1**
6. Round seed contain protein called **starch branching enzyme (SBEI)** is encoded by the wild-type allele of the gene (RR) which is dominant.
7. Incomplete dominance - Carl Correns - Mirabilis jalapa -F2 both phenotypic and genotypic ratios **1: 2: 1**  
**( 1 red : 2 pink : 1 white).**
8. **Codominance ( 1 : 2 : 1 )**  
 Example- i) Red and white flowers of **Camellia**,

- ii) inheritance of sickle cell **haemoglobin**,
  - iii) **ABO** blood group system in human beings.
9. **E. Baur** reported a lethal gene in **snapsdragon (*Antirrhinum sp.*)**.  
F1 progeny has identical phenotypic and genotypic ratio of - **1: 2**
10. Pleiotropy, - sickle cell anemia.  
pea plant - flower colour, seed colour and a leaf axil spot
11. i) Dominant epistasis - Fruit colour in summer squash \_\_\_\_\_ ( **12 : 3 : 1**)  
ii) Recessive epistasis- Flower colour of *Antirrhinum* spp. \_\_\_\_\_ **9: 3 : 4**  
iii) Duplicate genes- with cumulative effect Fruit shape in summer squash \_\_\_\_\_ **9: 6: 1**  
iv) Complementary genes -Flower colour in sweet peas \_\_\_\_\_ **9: 7**  
v) Supplementary genes Grain colour in Maize \_\_\_\_\_ **9: 3 : 4**  
vi) Inhibitor genes Leaf colour in rice plants \_\_\_\_\_ **13 : 3**  
vii) Duplicate genes Seed capsule shape (fruit shape) in shepherd's purse *Bursa bursa-pastoris* - **15 : 1**

### 3. Chromosomal Basis of Inheritance

1. **Thomas Hunt Morgan (1933)**- the role played by chromosomes in heredity.
2. **Sweet pea (*Lathyrus odoratus*)** - William Bateson and Reginald C. Punnett
3. Complete linkage - **Drosophila**.
4. Crossing over absent in - **Drosophila**
5. Incomplete linkage - **maize**
6. Crossing over - **Morgan**- pachytene stage
7. Genemap - **A.H. Sturtevant (Morgan student)**
8. Self Sterility - **Nicotiana**, - **East**
9. Mutation - **Hugo de Vries**- **Oenothera lamarckiana**
10. Trisomy - Blackeslee - *Datura stramonium*. ( $2n+1$ )- **Nicotiana, Pisum, Oenothera**,
11. Tetrasomy - **wheat**- ( $2n+2$ )
12. Double monosomy - **maize**
13. Nullisomy usually death of organism
14. Auto triploids - **Cyanodon dactylon** (natural autotriploid)  
(Seedless watermelon, apple, sugar beet, tomato banana are manmade autotriploids.)
15. Allopolyploid - **Raphano brassica, Triticale**
16. Colchicine - *Colchicum autumnale*,
17. Deletion mutation - *Drosophila* and maize
18. Duplication - *Drosophila*, maize, pea

### 4. Principles and Processes of Biotechnology

1. Fermentation Latin (**fervere** - to boil)
2. Study of fermentation- **Zymology**
3. Primary metabolites - **Ethanol, citric acid, lactic acid**
4. Secondary metabolites - **Amphotericin-B (*Streptomyces nodosus*),  
Penicillin (*Penicillium chrysogenum*)  
Streptomycin (*S. grises*),  
Tetracycline (*S. aureofacins*),  
alkaloids, toxic pigments, vitamins etc.**
5. 250 g of ***Methylophilus methylotrophus***, - to produce 25 tonnes of protein.
6. Single Cell Protein are as follows:
  - Bacteria - ***Methylophilus methylotrophus, Cellulomonas, Alcaligenes***
  - Fungi - ***Agaricus campestris, Saccharomyces cerevisiae* (yeast), *Candida utilis***
  - Algae - ***Spirulina, Chlorella, Chlamydomonas***
7. Exonucleases - e.g. **Bal 31, Exonuclease III**.
8. Endonucleases - e.g. **Hind II, EcoRI, PvuI, BamHI, TaqI**.
9. Only type **II enzyme** is preferred for use in recombinant DNA technology
10. **DNA ligase** isolated in T4 phase
11. pBR 322 plasmid - **Boliver Rodriguez**
12. chemicals - **polyethylene glycol (PEG) and dextran sulphate** induce DNA uptake into plant protoplasts.
13. **Southern Blotting**: The transfer of DNA from agarose gels to nitrocellulose membrane.
14. **Northern Blotting**: The transfer of RNA to nitrocellulose membrane.
15. **Western Blotting**: Electrophoretic transfer of Proteins to nitrocellulose membrane
16. Whatman 540 paper used in Northern **Blotting**
- Genome project - **Chlamydomonas (Algae )  
Arabidopsis thaliana, rice, maize.**
17. Bt Cotton - Cry group of endotoxin.  
Bt Brinjal - crystal protein gene (**Cry1Ac**)

Polyhydroxybutyrate (PHB)

Polyhydroxyalkanoates (**PHAs**) and polyhydroxybutyrate (**PHB**)

18. PHAs including Gram-positive like *Bacillus megaterium*, *Bacillus subtilis* and *Corynebacterium glutamicum*, Gram-negative bacteria like group of *Pseudomonas* sp. and *Alcaligenes eutrophus*

### 5. Plant Tissue Culture

- Gottlieb Haberlandt** (1902) the German Botanist proposed the concept **Totipotency**
  - father of tissue culture.
  - the first person to culture plant cells in artificial conditions using the mesophyll cells of *Lamium purpureum* in culture medium
- sterilization by autoclaving at **15 psi (121°C)** for **15 to 30 minutes** or dipping in **70% ethanol** followed by flaming and cooling.
- surface sterilization agents like **0.1% mercuric chloride, 70% ethanol** under aseptic condition inside the Laminar Air Flow Chamber.
- MS nutrient medium (**Murashige and Skoog 1962**) is commonly used.
- Agar**: A complex mucilaginous polysaccharide obtained from marine algae (sea weeds) used as **solidifying agent** in media preparation.
- The pH of medium is normally adjusted between **5.6 to 6.0** for the best result.
- constant temperature of **25°C ± 2°C** for optimal growth.
- The cultures require **50-60%** relative humidity
- 16 hours** of photoperiod by the illumination of cool white fluorescent tubes of approximately **1000 lux**.
- Isolation of protoplast**: 0.5% Macrozyme , 2% Onozuka cellulase enzymes dissolved in 13% sorbitol or mannitol at pH 5.4 , incubated over-night at 25°C, 20% sucrose.
- Fusion of protoplast**: suitable fusogen normally **PEG (Polyethylene Glycol)**.
- The fusion product of protoplasts without nucleus of different cells is called a **cybrid**
- Protoplast viability is tested with **fluorescein diacetate** before the culture.
- The cell wall formation occurs within **24- 48 hours**
- the first division of new cells occurs between **2-7 days** of culture.
- Cell suspension culture can be useful for the production of **secondary metabolites**
- Digoxin** - *Digitalis purpurea*- Cardiac tonic  
**Codeine** - *Papaver somniferum*- Analgesic  
**Capsaicin** - *Capsicum annum*- Rheumatic pain treatment  
**Vincristine**- *Catharanthus roseus* -Anticarcinogenic  
**Quinine**- *Cinchona officinalis* -Antimalarial
- Somatic embryogenesis is now reported in many plants such as **Allium sativum, Hordeum vulgare, Oryza sativa, Zea mays** and this possible in any plant.
- Synthetic seeds. – **agrose gel or Calcium alginate**
- Root formation – **Rhizogenesis**  
Shoot formation- **Caulogenesis**
- Cryopreservation** -cooling to very low temperature of -196°C using liquid nitrogen.
- Protective agents like **dimethyl sulphoxide, glycerol or sucrose**

### 6. Principles of Ecology

- Alexander von Humbolt** - Father of Ecology
- Eugene P. Odum** - Father of modern Ecology
- R. Misra** - Father of Indian Ecology
- ecology- proposed by **Reiter** (1868).
- Widely accepted definition of ecology was given by **Ernest Haeckel** (1869).
- The basic unit of ecological hierarchy is an individual organism.
- Habitat -combination of abiotic or environmental factors.
- Niche**-An ecological niche refers to an organism's place in the biotic environment and its functional role in an ecosystem.
- Light **400-800 nm**- blue – Maximum photo synthesis  
**500-600 nm** – green low photosynthesis  
**600-700 nm** -red- maximum photosynthesis
- Helophytes** – light loving- Angiosperms.  
**Sciophytes**- Shade loving -Bryophytes, pteridophytes
- Palaeoclimatology**–Helps to reconstruct past climates
- Raunkiaer** classified the world's vegetation into the following four types.
- 1. Eurythermal**: Organisms which can tolerate a wide range of temperature fluctuations.  
Example: **Zostera (A marine Angiosperm) and Artemisia tridentata.**
- 2. Stenothermal**: Organisms which can tolerate only small range of temperature variations.  
Example: **Mango and Palm (Terrestrial Angiosperms).**

14. Mango plant does not grow in temperate countries like **Canada and Germany**.
15. The total amount of water salinity in different water bodies are :
  - i). **5%** in inland water (Fresh water)
  - ii). **30 – 35%** in sea water
  - iii). **More than 100%** in hypersaline water (**Lagoons**)
16. **1. Euryhaline:** Organisms which can live in water with wide range of salinity.  
Examples: Marine algae and marina angiosperms  
**2. Stenohaline:** Organisms which can withstand only small range of salinity.  
Example: Plants of estuaries.
17. **Pedology** -Study of soil
18. **Capillary water** – available to plants
19. **best soil pH 5.5-6.8**
20. Best soil for plant cultivation **Loamy soil**
  - 1. Halophytes:** Plants living in saline soils
  - 2. Psammophytes:** Plants living in sandy soils
  - 3. Lithophytes:** Plants living on rocky surface
  - 4. Chasmophytes:** Plants living in rocky crevices
  - 5. Cryptophytes:** Plants living below the soil surface
  - 6. Cryophytes:** Plants living on surface of ice
  - 7. Oxylophytes:** Plants living in acidic soil
  - 8. Calciphytes:** Plants living in calcium rich alkaline soil.
21. Nitrogen fixing bacteria. – **Rhizobium**  
Mutualism -Ex - **Azolla, Anabaena, Cycas, mycorrhiza**  
Commensalism- (**Epiphytes**)- **Vanda**  
Insectivorous plant – **Drosera (Sundew plants in mand Nepenthes, Dionaea, Utricularia, Sarracenia**
22. **25 %** of all insects are known as **phytophagous**(feeds on plant sap and other parts of plant)
- 23. Defense mechanisms** are evolved to avoid their predations by plants.  
Examples:  
**Calotropis** produces highly poisonous cardiac glycosides,  
Tobacco produces **nicotine**,  
coffee plants produce **caffeine**,  
**Cinchona** plant produces **quinine**.  
Thorns of **Bougainvillea**,  
spines of **Opuntia**,  
latex of **cacti**
24. Total Stemparasite – **Acacia. Duranta,**
25. Total root parasite- **Balanophora, orabanche, Rafflesia,**
26. partial stem parasite – **Viscom, Loranthus**
27. **Viscum** and **Loranthus** are **partial stem parasites**.
28. **Santalum** (Sandal Wood) is a **partial root parasite**.
29. **Ophrys** an orchid '**floral mimicry** '.
30. **Carausium morosus** – stick insect or walking stick. It is a protective mimicry.
31. **Phyllium frondosum** – leaf insect, another example of protective mimicry.
32. Myrmecophily. Example: **Acacia and acacia ants**.
33. **Lotus seeds** show highest longevity in plant kingdom
34. smallest flowering plant – **Wolffia**.
35. **Hygrophytes:** The plants which can grow in moist damp and shady places are called hygrophytes.  
Examples: **Habenaria (Orchid), Mosses (Bryophytes)**, etc.
- 36. Ephemerals: drought escapers or drought evaders.**  
Examples: **Argemone, Mollugo, Tribulus and Tephrosia**.
37. **heterophylly** (Submerged leaves are dissected and aerial leaves are entire).  
Example: **Ranunculus, Limnophila heterophylla and Sagittaria**
38. The root caps are replaced by **root pockets**. Example: **Eichhornia**
39. Root absent – **worffia, salvinia**
40. Succulent – **Opuntia, Aloe, Bryophyllum, Begonia**
41. Non succulent – True xerophyte Ex- **Casuarina, Nerium, Zizyphus, Acacia**
42. Trichophyllous plant-stem and leaf covered with hair Example: **Cucurbits (Melothria and Mukia )**
43. (phylloclades-**opuntia**
44. Cladode – **Asparagus**
45. phyllode – **Acacia melanoxyton**.
46. Mesophytes -**Maize, Hibiscus**.
47. **Tropophytes** are plants which behave as xerophytes at summer and behave as **mesophytes** (or)

**hydrophytes** during rainy season.

### 7. Ecosystem

1. The term Ecosystem introduced by **Ag. Tansley**.
2. **Odum** – Ecosystem is structural and functional unit of Ecology.
3. **34% Light** reflected back to atmosphere.  
**10%** used by ozone water Vapors.  
**56%**. Reaches Earth.  
**2-10%**. Light used by plants for photosynthesis.
4. **400-700** light essential for photosynthesis.
5. 1<sup>st</sup> law of thermodynamics – **Energy is no loss no gain**.
6. 2<sup>nd</sup> law of thermodynamics -**Loss 10% each level**
7. 10% Law introduced by **Lindeman**.
8. Ecological pyramids introduced by **Charles Elton**
9. Primary succession. Ex – **Microbes, Lichens. Mosses** .
10. **Secondary succession** -forest destroyed by fire
11. Plant succession stages – **7 stages**.

### 8. Environmental issues.

1. Green house gas – **CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CFC**  
**CH<sub>4</sub> -20%      CFC -14%      CO<sub>2</sub> -60%      Others -6%**
2. Coral bleaching of observed in- **Gulf of Mannar, Tamilnadu**
3. **Troposphere** (lower layer) bad ozone.  
**Stratosphere** ( upper layers Good ozone ,
4. The measurement of ozone – **DU ( Dobson unit)**
5. **Purple and blue**- least ozone.
6. **Yellow and red**- more ozone.
7. World ozone day- **Sep 16**.
8. Ozone melting – **Vienna conference. 1985, Montreal protocol – 1987, Kyoto protocol – 2007**
9. Plant indicator:  
SO<sub>2</sub> - **Lichens, Ficus, pinus, Rose**  
Nitrate – **Petunia, Chrysanthemum**.  
Gladidus-**Flouride**,  
Heavy metal – **Robinia pseudoacacia**.
10. Agro forestry – **Casuarina, Eucalyptus, Malaivembu Teak kadambu,**
11. silvopasture – **woody plant with pasture**.
12. Protein Bank **Acacia nilotica, etc**.
13. Hedges (border) tree – **Sesbania grandiflora**,
14. Trees cultivated in private land **2007-08 to 2011- 12**.
15. Total forest **extension center- 32**
16. Forest man of india – **Jadav "Molai" Payeng**
17. Invasive species – **Eichhornia crassipes**- South America.  
**Prosopis juliflora** - Mexico and South America.
18. Carbon Sequestration  
Micro algae-**Chlorella, scenedesmus, Chrococcus ,Chlamydomonas**.  
Tree - **Eugenia caryophyllata, Tecomastans**,
19. **8 hours laptop** used and released **2 kg Co<sub>2</sub>**
20. **SCATSAT – I** Sep. 2016 -Weather forecasting, cyclone prediction and tracking services in India  
**INSAT 3DR** Sep. 2016 -**Disaster management**  
**CARTOSAT – 2** Jan. 2018 -**Earth observation**  
**GSAT – 6A** March 2018 -**Communication**  
**CARTOSAT – 2** (100th Satellite) -Jan. 2018- **To watch border surveillance**

### 9. Plant Breeding

1. **Dr. M. S. Swaminathan** – He is a pioneer mutation breeder.
2. **Sir. T.S. Venkataraman** – An eminent sugarcane breeder.
3. **Dr. B.P. Pal** – Famous wheat breeder, developed superior disease resistant varieties of wheat.
4. **Dr. K. Ramiah** – Eminent rice breeder, developed several high yielding varieties of rice.
5. **N.G.P. Rao** – An eminent sorghum breeder,
6. world's first hybrid of **Sorghum (CSH-1)**.
7. **C.T. Patel** – Who developed world's first cotton hybrid.
8. **Choudhary Ram Dhan** – Wheat breeder, who is famous for C-591 variety of wheat, which made Punjab
9. Rhizobium increase yield- **15-40%**
10. Azolla increase yield -**40-60%**.
11. **seaweed liquid fertilizer** – Kelp (brown algae)

12. **alginate** are produced in- kelp (brown algae)
13. **Biopesticides** – Trichoderma (Fungi), Beaveria
14. Green manuring – **Crotalaria juncea, Tephrosia purpurea,**
15. Example for insitu plants-**sun hemp, coupea, green gram**
16. Example for Exsitu plants- **Sesbania grandiflora, etc**
17. **Primary introduction** without any alternation.
18. **Secondary introduction** with alternation.
19. **Mass selection** – difficult to distinguish the hereditary Variation from environmental variation
20. The term pure line coined by **Johannsen(1903)**
21. New genotype are not created in- **pure line Selection**
22. **Clonal selection** are used by only in- Vegetative Propagated Plants
23. The character's or unchanged for long time. **Clonal selection.**
24. First natural hybridization- **maize (cotton mother)**
25. Removal of Anther- **emasculation,**
26. Inter specific hybridization – **Deviraj**
27. Inter generic – **Raphano brassica, Triticale**
28. Heterosis- **G.H.Shul-1912**

#### 10. Economically useful plants and Entrepreneurial Botany

1. Foxtail millet-**Setaria italica** use – Heart, eye sight, lactating Mother.
2. kodo millet – **Paspalum scrobiculatum.** orgin-west Africa, make pudding, diuretic Cure Constipation, reduce obesity, Blood sugar, blood pressure.
3. Cardamom. – **Elettaria cardamomum** Family- **zingiberaceae.**  
Origin- **South india, srilanka**
4. Queen of spices – **Cardamom**
5. Black pepper – **Piper nigrum.**  
Family – **piperaceae.**
6. King of Spices – **Black pepper**
7. Black gold of india – **Black pepper.**
8. **piperine** present in – Black Pepper .
9. Turmeric - **Curcuma longa.**  
Family: **zingiberaceae.**
- 10 **Curcumin** (yellow colour) extracted from -**Curcuma longa**
11. **Curcumin** use anti, bacterial, fungal Viral – anti cancer.
12. Red pepper – **Capsicum annum. C. frutescens.**  
Family: **Solanaceae .**  
Chillis contain **vitamin A,C,E**  
Origin: **south America**
13. World hottestedchillis – **Carolina reaper.**
14. Hottest chillls in india – **Naga viper**
15. **Capsaicin** are present in **Red pepper**
16. Tamarind – **Tamarindus indica.** Family- Fabaceae.  
Origin – **Tropical African region.**
17. Dates of india – **Tamarind.**
18. Sweet tamarind imported from – **Thailand and Malaysia**
19. Teak-**Tectona grandis**  
Family – **Lamiaceae.**
20. Total number of plants -Used in siddha-**800-herbs**
21. **Ayurveda** – **500**
22. Keezhanelli-**Phyllanthus amarus.**  
Family: **Euphorbaceae** -Phyllanthaceae  
Active principle-**Phyllanthin.**  
Jaundice, hepatitis B virus. Nilavembu – **Andrographis paniculata**-King of Bitters  
Active principle- **Andrographolides.** – Liver disorder Malaria dengue.
23. Opium poppy **papaver sommiferum.** Family – **papavaraceae.**  
**Morphine** painkiller derived from **papaver somnifra**
24. Cannabis – Cannabis sativa. Family – Cannabiaceae. – **trans-tetrahydrocanabinal (THC** -pain reliever, glaucoma, asthma - **Glaucoma** a condition in which pressure develops in the eyes.

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