

12th
STD

INSTANT SUPPLEMENTARY EXAM - JUNE 2023

PART - III - BOTANY

Reg. No.

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TIME ALLOWED : 3.00 HOURS]

(with Answers)

[MAXIMUM MARKS : 70

- Instructions :** (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
- (2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART - I

- Note :** (i) Answer **all** the questions. (15 × 1 = 15)
- (ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1. An example for brush fibre yielding plant:

- (a) Cyperus (b) Neem
(c) Cotton (d) Palm

2. Which of the given plant produces cardiac glycosides?

- (a) Calotropis (b) Acacia
(c) Nepenthes (d) Utricularia

3. Coleorhiza is found in :

- (a) Paddy (b) Bean
(c) Pea (d) Tridax

4. Removal of introns and joining of exons in a defined order during transcription is called as _____.

- (a) Splicing (b) Looping
(c) Inducing (d) Slicing

5. Jaya and Ratna are the semi-dwarf varieties of :

- (a) Wheat (b) Rice
(c) Cowpea (d) Mustard

6. Pond is a type of _____.

- (a) Forest ecosystem
(b) Grassland ecosystem
(c) Marine ecosystem
(d) Freshwater ecosystem

7. The period of Mendel's hybridization experiments:

- (a) 1850 - 1870 (b) 1870 - 1877
(c) 1856 - 1863 (d) 1857 - 1869

8. Plasmids are :

- (a) required by bacteria
(b) confer resistance to antibiotics
(c) circular DNA molecules
(d) tiny bacteria

9. The prevention of large scale loss of biological integrity :

- (a) Bio - patent (b) Bio - ethics
(c) Bio - safety (d) Bio - fuel

10. The plants which are grown in silvopasture system are :

- (a) Sesbania and Acacia
(b) Solanum and Crotalaria
(c) Clitoria and Begonia
(d) Teak and Sandal

11. The unit for measuring ozone thickness is :
 (a) Joule (b) Kilo
 (c) Dobson (d) Watt
12. Select the wrong pair :
 (a) Andrographis - hepato protective
 (b) Adathodai - broncho dialator
 (c) Phyllanthus - anti-diabetic
 (d) Curcumin - anti-oxidant
13. Arrange the following based on the process of recombinant DNA technology
 (I) Amplication of the gene.
 (II) Insertion of recombinant DNA into the host cells.
 (III) Cutting of DNA at specific location using restriction enzyme.
 (IV) Isolation of genetic material (DNA).
 (a) II, III, IV, I (b) IV, II, III, I
 (c) I, II, III, IV (d) IV, III, I, II
14. Ophrys an orchid flower resembling the female insect to attract the male insect to get pollinated is called as :
 (a) Myrmecophily
 (b) Ecological equivalents
 (c) Mimicry (d) None of the above
15. In majority of plants pollen is liberated at :
 (a) 1 celled state (b) 2 celled stage
 (c) 3 celled stage (d) 4 celled stage

PART - II

Note: Answer **any six** of the following questions. Question number **24** is compulsory.

(6 × 2 = 12)

16. Define - Bonsai.
17. How rhytidome acts as the structural defence by plants against fire?
18. Differentiate Secretary and Invasive Tapetum.

19. Name the chemicals used in gene transfer.
20. Productivity of profundal zone will be low. Why?
21. What is back cross?
22. What is carbon capture and storage (CCS)?
23. Name any two enzymes involved in DNA replication in eukaryotes.
24. Define - Heterosis.

PART - III

Note: Answer **any six** of the following questions. Question number **33** is compulsory.

(6 × 3 = 18)

25. Write the significance of parthenocarpy.
26. Write short notes on Cryopreservation.
27. Differentiate primary introduction from secondary introduction.
28. What are the reasons for Mendel's success in his breeding experiment?
29. What is Albedo effect? Write its effects.
30. Write three plants that are found in Sub-Alpine forest.
31. Write the advantages of Bt cotton.
32. How do sacred groves help in the conservation of biodiversity?
33. What is pseudo cereal? Give an example.

PART - IV

Note: Answer **all** the questions. (5 × 5 = 25)

34. (a) Describe dispersal of fruit and seeds by animals.

(OR)

- (b) Enumerate the characteristic features of Entomophilous flowers.

35. (a) What are the King and Queen of spices? Explain about them and their uses.

(OR)

- (b) Compare the various types of Blotting techniques.

36. (a) Explain the different types of hybridization.

(OR)

(b) Explain the basic concepts involved in plant tissue culture.

37. (a) Describe dominant epistasis with an example.

(OR)

(b) Generally human activities are against the ecosystem. As a student, how will you help of protect ecosystem?

38. (a) Write the benefits of Agroforestry.

(OR)

(b) What attributes make Arabidopsis a suitable model plant for molecular genetic research?

ANSWERS

PART - I

- 1. (d) Palm
- 2. (a) Calotropis
- 3. (a) Paddy
- 4. (a) Splicing
- 5. (b) Rice
- 6. (d) Freshwater ecosystem
- 7. (c) 1856 - 1863
- 8. (b) confer resistance to antibiotics
- 9. (c) Bio-Safety
- 10. (a) Sesbania and Acacia
- 11. (c) Dobson
- 12. (c) Phyllanthus - anti-diabetic
- 13. (d) IV, III, I, II
- 14. (c) Mimicry
- 15. (b) 2 celled stage

PART - II

16. Bonsai is a Japanese art form using miniature trees grown in containers that mimic the shape and scale of full size trees.

17. (i) Rhytidome is the structural defense by plants against fire. The outer bark of trees which extends to the last formed periderm is called Rhytidome.

(ii) It is composed of multiple layers of suberized periderm, cortical and phloem tissues. It protects the stem against fire, water loss, invasion of insects and prevents infections by microorganisms

18.

| | Secretory tapetum (parietal/glandular/cellular) | Invasive tapetum (periplasmodial) |
|----|--|---|
| 1. | The tapetum retains the original position and cellular integrity | The cells lose their inner tangential and radial walls. |
| 2. | It nourishes the developing microspores. | The protoplast of all tapetal cells coalesces to form a periplasmodium. |

19. (i) Polyethylene glycol.
(ii) Dextran sulphate.

20. (i) Profundal is the deeper region of a pond below the limnetic zone with no effective light penetration and predominance of heterotrophs.

(ii) That's the zone where no sunlight penetrates. So the photosynthesis cannot take place. Due to the absence of producers, productivity of profundal zone is low.

21. Back cross is a cross of F₁ hybrid with any one of the parental genotypes.

22. Carbon capture and storage is a technology of capturing carbon dioxide and injects it deep into the underground rocks to a depth of 1 km or more and it is an approach to mitigate global warming by capturing CO₂ from large point sources such as industries and power plants and subsequently storing it instead of releasing it into the atmosphere.

23. **Enzymes involved in DNA replication:**

- (i) Helicases
- (ii) Topoisomerase

24. (i) Heterosis (hetero- different; sis - condition) G.H. Shull was the first scientist to use the term heterosis in 1912.

(ii) The superiority of the F₁ hybrid in performance over its parents is called heterosis or hybrid vigour.

PART - III

25. **Significance:**

- (i) Have great significance in horticulture.
- (ii) Have great commercial importance.
- (iii) Used for the preparation of jams, jellies, sauces, fruit drinks etc.
- (iv) High proportion of edible part is available due to the absence of seeds.

26. **Cryopreservation :**

(i) Cryopreservation, also known as cryo-conservation, is a process by which protoplasts, cells, tissues, organelles, organs, extracellular matrix, enzymes or any other biological materials are subjected to preservation by cooling to very low temperature of -196°C using liquid nitrogen.

(ii) At this extreme low temperature, any enzymatic or chemical activity of the biological material will be totally stopped and this leads to preservation of material in dormant status.

(iii) Later these materials can be activated by bringing to room temperature slowly for any experimental work.

(iv) Protective agents like dimethyl sulphoxide, glycerol or sucrose are added before cryopreservation process. These protective agents are called cryoprotectants, since they protect the cells, or tissues from the stress of freezing temperature.

27.

| | Primary Introduction | Secondary Introduction |
|----|---|---|
| 1. | Introduced variety is well adapted to the new environment | Introduced variety is subjected to selection to isolate a superior variety. |
| 2. | There is no alternation to the original genotype. | The variety is hybridized with a local variety to transfer one or a few characters to them. |

28. (i) He applied mathematics, and statistical methods to biology and laws of probability in his experiments.

(ii) He followed scientific methods and kept accurate and detailed records that include quantitative data of the outcome of his crosses.

(iii) His experiments were carefully planned and used large samples.

- (iv) The pairs of contrasting characters which were controlled by factor (genes) were present on separate chromosomes.
- (v) The parents selected were pure breed lines and the purity was tested by self crossing the progeny for many generations.

29. Aerosols with small particles is reflecting the solar radiation entering the atmosphere is known as Albedo effect.

Effects:

- 1. Reduces the temperature (cooling) limits.
- 2. It reduces photosynthesis and respiration.

30. The common tree species Abies, Pinus, Betula, Quercus, Salix, Rhododendron with plenty of epiphytic orchids, mosses and lichens are found in sub alpine forest.

31. **Advantages of Bt cotton:**

- (i) Yield of cotton is increased due to effective control of bollworms.
- (ii) Reduction in insecticide use in the cultivation of Bt cotton.
- (iii) Potential reduction in the cost of cultivation.

32. (i) Sacred groves are the patches or grove of cultivated trees which are community protected and are based on strong religious belief systems.

(ii) These groves provide a number of ecosystem services to the neighbourhood like protecting watershed, fodder, medicinal plants and micro climate control.

33. The term pseudo-cereal is used to describe foods that are prepared and eaten as a whole grain, but are botanical outliers from grasses.

Example :

Quinoa - seed from the *Chenopodium quinoa* plant.

It is a gluten-free, whole-grain carbohydrate, as well as a whole protein.

PART - IV

34. (a)

Dispersal of fruits and seeds by animals is called *zoochory*.

They have the following devices:

(i) **Hooked fruit :** The surface of the fruit or seeds have hooks, (*Xanthium*), barbs (*Andropogon*), spines, (*Aristida*) they adhere to the body of animals or clothes of human beings and get dispersed.

(ii) **Sticky fruits and seeds :**

(a) Fruits with sticky glandular hairs adhere to the fur of grazing animals.

Example : *Boerhaavia* and *Cleome*.

(b) Fruits with viscid layer adhere to the beak of the bird which eat them and they rub them on to the branch of the tree, they disperse and germinate.

Example : *Cordia* and *Alangium*

(iii) **Fleshy fruits :** Fleshy fruits with conspicuous colours are dispersed by human beings to distant places after consumption.

Example: *Mango* and *Diplocyclos*

(OR)

- (b) (i) Flowers are generally large or if small, they are aggregated in dense inflorescence.
Examples: Asteraceae flowers.
- (ii) Flowers are brightly coloured. The adjacent parts of the flowers may also be brightly coloured to attract insect.
Examples: Poinsettia and Bougainvillea the bracts become coloured.
- (iii) Flowers are scented and produce nectar.
- (iv) Flowers with no secretion of nectar, the pollen is consumed as food or used in building up of its hive by honey bees. Pollen and Nectar are the floral rewards for the visitors.
- (v) Flowers pollinated by flies and beetles produce foul odour to attract pollinators.
- (vi) In some flowers juicy cells are present which are pierced and the contents are sucked by the insects.

35. (a) Cardamom is called as “Queen of Spices”. In India it is one of the main cash crops cultivated in the Western Ghats and North Eastern India.

Botanical name: *Elettaria cardamomum*

Uses :

- (i) The seeds have a pleasing aroma and a characteristic warm, slightly pungent taste.
- (ii) It is used for flavouring confectioneries, bakery products and beverages.
- (iii) The seeds are used in the preparation of curry powder, pickles and cakes.

- (iv) Medicinally, it is employed as a stimulant and carminative.
- (v) It is also chewed as a mouth freshener.

Black Pepper

Botanical name: *Piper nigrum*

- (i) Pepper is called as the “King of Spices” and also termed as “Black Gold of India”.
- (ii) Kerala, Karnataka and Tamil Nadu are the top producers in India.
- (iii) The pungency of the pepper is due to the presence of alkaloid Piperine.
- (iv) Two types of pepper are black and white pepper, which are available in the market.

Uses :

- (i) It is used for flavouring in the preparation of sauces, soups, curry powder and pickles.
- (ii) It is used in medicine as an aromatic stimulant for enhancing salivary and gastric secretions and also as a stomachic.
- (iii) It enhances the bio-absorption of medicines.

(OR)

(b) **Southern Blotting :** The transfer of DNA from agarose gels to nitrocellulose membrane.

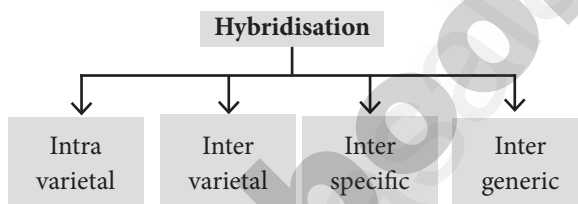
Northern Blotting : The transfer of RNA to nitrocellulose membrane.

Western Blotting : Electrophoretic transfer of Proteins to nitrocellulose membrane.

| | Southern blotting | Northern blotting | Western blotting |
|---------------|---------------------------|-----------------------|--------------------|
| Name | Southern name of inventor | Northern a misnomer | Western a misnomer |
| Separation of | DNA | RNA | Proteins |
| Denaturation | Needed | Not needed | Needed |
| Membrane | Nitrocellulose | Amino benzyloxymethyl | Nitrocellulose |
| Hybridisation | DNA-DNA | RNA-DNA | Protein-antibody |
| Visualising | Autoradiogram | Autoradiogram | Dark room |

36.(a) Hybridization is the method of producing new crop varieties in which two or more plants of unlike genetically constitution is crossed together that result in a progeny called hybrid.

According to the relationship between plants, the hybridization is divided into.



(i) **Intravarietal hybridization:**

- (a) Crossing the plants of same variety.
- (b) It is useful only in the self-pollinated crops.

(ii) **Intervarietal hybridization:**

- (a) Crossing the plants belonging to two different varieties of the same species
- (b) It is also known as intraspecific hybridization.
- (c) This technique improving self-pollinated as well as cross pollinated crops.

(iii) **Interspecific hybridization:**

- (a) Crossing the plants belonging to different species belonging to the same genus.
- (b) It is also called **intra-genic hybridization**.
- (c) It is used for transferring the genes of disease, insect, pest and drought resistance from one species to another.

Example: *Gossypium hirsutum* x

Gossypium arboreum.

(iv) **Intergeneric hybridization:**

- (a) Crossing the plants belonging to two different genera.
- (b) The disadvantages are hybrid sterility, time consuming and expensive procedure.

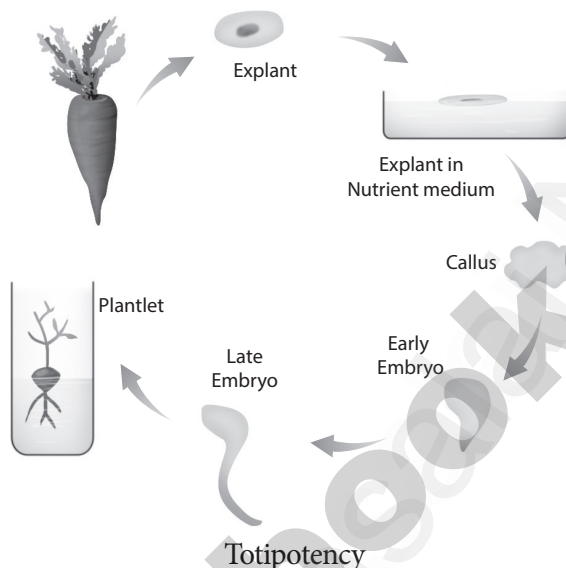
Example: *Raphanobrassica*, *Triticale*.

(OR)

(b) Basic concepts of plant tissue culture are totipotency, differentiation, dedifferentiation and redifferentiation.

Totipotency :

The property of live plant cells that they have the genetic potential when cultured in nutrient medium to give rise to a complete individual plant.



Differentiation :

The process of biochemical and structural changes by which cells become specialized in form and function.

Redifferentiation :

The further differentiation of already differentiated cell into another type of cell. For example, when the component cells of callus have the ability to form a whole plant in a nutrient medium, the phenomenon is called redifferentiation.

Dedifferentiation :

The phenomenon of the reversion of mature cells to the meristematic state leading to the formation of callus is called dedifferentiation.

37. (a) Interlocus interactions take place between the alleles at different loci i.e between alleles of different genes. It includes the following:

Dominant Epistasis:

- (i) It is a gene interaction in which two alleles of a gene at one locus interfere and suppress or mask the phenotypic expression of a different pair of alleles of another gene at another locus.
- (ii) The gene that suppresses or masks the phenotypic expression of a gene at another locus is known as **epistatic**.

- (iii) In the summer squash, the fruit colour locus has a dominant allele 'W' for white colour and a recessive allele 'w' for coloured fruit. 'W' allele is dominant that masks the expression of any colour.
- (iv) In another locus, hypostatic allele 'G' is for yellow fruit and its recessive allele 'g' for green fruit. In the first locus, the white is dominant to colour where as in the second locus yellow is dominant to green.
- (v) When the white fruit with genotype WWgg is crossed with yellow fruit with genotype wwGG, the F₁ plants have white fruit and are heterozygous (WwGg). When F₁ heterozygous plants are crossed they give rise to F₂ with the phenotypic ratio of 12 white : 3 yellow : 1 green.

| | | | | |
|-------------------------------|--|---------------|-----------------------|----------------|
| Parent generation | White fruit WW gg | X | Yellow fruit ww GG | |
| Gametes | ↓ Wg | X | ↓ wG | |
| F₁ (selfed) | White fruit WwGg | | | |
| F₂ | WG | Wg | wG | wg |
| WG | WWGG White | WWGg White | WwGG White | WwGg White |
| Wg | WWGg White | WWgg White | WwGg White | Wwgg White |
| wG | WwGG White | WwGg White | wwGG Yellow | wwGg Yellow |
| wg | WwGg White | Wwgg White | wwGg Yellow | wwgg Green |
| Phenotypes | White fruit Yellow fruit Green fruit | | | |
| Phenotypic ratio | 12 : 3 : 1 | | | |

Dominant epistasis in summer squash

- (vi) Since W is epistatic to the alleles 'G' and 'g', the white which is dominant, masks the effect of yellow or green.
- (vii) Homozygous recessive (ww genotype) - Coloured fruits (4/16).
- (viii) Double recessive ('wwgg') - Green fruit (1/16).
- (ix) Plants having only 'G' in its genotype (wwGg or wwGG) - Yellow fruit(3/16).

(OR)

(b) If we change our everyday life style, we can help to protect the planet and its ecosystem.

Therefore, we have to practice the following in our day to day life:

- (i) Buy and use only ecofriendly products and recycle them.
- (ii) Grow more trees
- (iii) Choose sustained farm products (vegetables, fruits, greens, etc.)
- (iv) Reduce the use of natural resources.
- (v) Recycle the waste and reduce the amount of waste you produce.
- (vi) Reduce consumption of water and electricity.
- (vii) Reduce or eliminate the use of house-hold chemicals and pesticides.
- (viii) Maintain your cars and vehicles properly. (In order to reduce carbon emission)
- (ix) Create awareness and educate about ecosystem protection among your friends and family members.

Go green

- (i) It refers to the changing of one's lifestyle for the safety and benefits of the environments (Reduce, Reuse, Recycle)
- (ii) Way to go green and save green
 - (a) Close the tap when not in use.
 - (b) Switch off the electrical gadgets when not in use.
 - (c) Never use plastics and replace them with biodegradable products
 - (d) Always use ecofriendly technology and products.

38. (a) **Benefits of agroforestry:**

- (i) It is a solution for the problem of soil and water conservation and also to stabilise the soil (salinity and water table) reduce landslide and water run-off problem.
- (ii) Nutrient cycling between species improves and organic matter is maintained.
- (iii) Trees provide micro climate for crops and maintain O₂ – CO₂ balance, atmospheric temperature and relative humidity.
- (iv) Suitable for dry land where rainfall is minimum and hence it is a good system for alternate land use pattern.
- (v) Multipurpose tree varieties like Acacia are used for wood pulp, tanning, paper and firewood industries.
- (vi) Agro-forestry is recommended for the following purposes. It can be used as Farm Forestry for the extension of forests, mixed forestry, shelter belts and linear strip plantation.

(OR)

- (b) (i) It is a model plant for the study of genetic and molecular aspects of plant development.
- (ii) *Arabidopsis thaliana* – Thale cress, Mouse ear cress belongs to mustard family and it is the first flowering plant, where its entire genome is sequenced.
- (iii) The two regions of the nucleolar organiser ribosomal DNA which codes for the ribosomal RNA are present at the extremity of chromosomes 2 and 4.
- (iv) It is diploid plant having small genome with $2n = 10$ chromosomes.
- (v) Several generations can be produced in one year. So it facilitates rapid genetic analysis.
- (vi) The genome has low repetitive DNA, over 60% of the nuclear DNA have protein coding functions.
- (vii) The plant is small, self-fertilizes, annual long-day plant with short-life cycle.
- (viii) Large numbers of seeds are produced and they are easy to be grown in laboratory.
- (ix) It is easy to induce mutations.
- (x) It has many genomic resources and the transformation can be done easily.

