

12th
STD

PUBLIC EXAMINATION - MARCH 2024
PART - III
BIOLOGY

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
BIO-BOTANY (35 Marks)
SECTION - 1

- Note :** (i) Answer **all** the questions. (8 × 1 = 8)
(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

- The unit for measuring ozone thickness is :
(a) Watt (b) Dobson (c) Kilo (d) Joule
- Fruit colour in squash is an example of :
(a) Complementary genes (b) Recessive epistasis
(c) Inhibitory genes (d) Dominant epistasis
- Size of pollen grain in myosotis is _____ micrometer.
(a) 10 (b) 2000 (c) 20 (d) 200
- Assertion (A) :** Gamma rays are generally used to induce mutation in wheat varieties.
Reason (R) : Because they carry lower energy to non-ionize electrons from atom.
(a) (A) is wrong, (R) is correct (b) (A) and (R) are correct
(c) (A) and (R) are wrong (d) (A) is correct, (R) is wrong
- The wavelength of photosynthetically active radiation lies between the range of :
(a) 200 - 700 nm (b) 300 - 700 nm (c) 500 - 700 nm (d) 400 - 700 nm
- Match the following :

Column -I	Column -II
(1) Cowpea	(i) Pusa Sadabahar
(2) Wheat	(ii) Pusa Swarnim
(3) Chilli	(iii) Himgiri
(4) Brassica	(iv) Pusa Komal
(a) (1)-(iv), (2)-(i), (3)-(ii), (4)-(iii)	(b) (1)-(ii), (2)-(iv), (3)-(i), (4)-(iii)
(c) (1)-(ii), (2)-(i), (3)-(iv), (4)-(iii)	(d) (1)-(iv), (2)-(iii), (3)-(i), (4)-(ii)

[1]

7. The native of groundnut is :
(a) North America (b) Philippines (c) Brazil (d) India
8. Plasmids are :
(a) tiny bacteria (b) circular protein molecules
(c) confer resistance to antibiotics (d) required by bacteria

SECTION - 2

Note : Answer **any four** of the following questions. (4 × 2 = 8)

9. Give the names of the scientists who rediscovered Mendelism.
10. What is called phyto remediation?
11. Mention the names of the enzymes required for Genetic engineering.
12. What are embryoids?
13. Pyramid of energy is always upright. Give reasons.
14. How are microbial inoculants used to increase the soil fertility?

SECTION - 3

Note : Answer **any three** of the following questions. Q.No. 19 is **Compulsory**. (3 × 3 = 9)

15. What is genetic mapping? Write its uses.
16. Give an account on Cryopreservation.
17. Distinguish between habitat and niche.
18. How do forests help in maintaining the climate?
19. Draw the structure of an ovule and label its parts.

SECTION - 4

Note : Answer **all** the questions. (2 × 5 = 10)

20. (a) What is single cell protein? Mention its applications.
(OR)
(b) What are Millets? What are its types? Give an example for each type.
21. (a) Bring out the inheritance of chloroplast gene with an example.
(OR)
(b) Discuss the steps involved in the microsporogenesis.

ANSWERS

SECTION - 1

1. (b) Dobson
2. (d) Dominant epistasis
3. (a) 10
4. (d) (A) is correct, (R) is wrong

5. (d) 400 - 700 nm
6. (d) (1)-(iv), (2)-(iii), (3)-(i), (4)-(ii)
7. (c) Brazil
8. (c) confer resistance to antibiotics

SECTION - 2

9. Mendel died in 1884. In 1900 the work of Mendel's experiments were rediscovered by three biologists,
 - (i) Hugo de Vries – Holland
 - (ii) Carl Correns – Germany
 - (iii) Erich von Tschermak – Austria
10. (i) Rice and *Eichhornia* (water hyacinth) tolerate cadmium by binding it to their proteins.
(ii) These plants otherwise can also be used to remove cadmium from contaminated soil, this is known as Phytoremediation.
11. **Enzymes involved in Genetic Engineering :**
 - (i) Restriction Enzymes
 - (a) Exonucleases
 - (b) Endonucleases
 - (ii) Alkaline phosphatase
 - (iii) DNA Ligase
12. **Embryoids :** Somatic embryogenesis is the formation of embryos from the callus tissue directly and these embryos are called **Embryoids** or from the *in vitro* cells directly form pre-embryonic cells which differentiate into embryoids.
13. The bottom of the pyramid of energy is occupied by the producers. There is a gradual decrease in energy transfer at successive trophic levels from producers to the upper levels. Therefore, the pyramid of energy is always upright.
14. (i) They are efficient in fixing nitrogen, solubilising phosphate and decomposing cellulose.
(ii) They are designed to improve the soil fertility, plant growth, and also the number and biological activity of beneficial micro-organisms in the soil.
(iii) They are ecofriendly organic agro inputs and are more efficient and cost effective than chemical fertilizers.
(iv) **Other name for biofertilizers :** Microbial cultures, bioinoculants, bacterial inoculants or bacterial fertilizers.

SECTION - 3

15. The diagrammatic representation of position of genes and related distances between the adjacent genes is called genetic mapping. It is directly proportional to the frequency of recombination between them. It is also called as linkage map. The concept of gene mapping was first developed by Alfred H Sturtevant.

Uses of genetic mapping:

- (i) It is used to determine gene order, identify the locus of a gene and calculate the distances between genes.
- (ii) They are useful in predicting results of dihybrid and trihybrid crosses.
- (iii) It helps to understand the overall genetic complexity of particular organism.

16. 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.

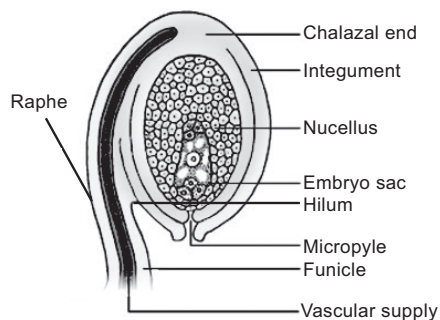
17.

	Habitat	Niche
1.	A specific physical space occupied by an organism (species)	A functional space occupied by an organism in the same eco-system
2.	Same habitat may be shared by many organisms (species)	A single niche is occupied by a single species
3.	Habitat specificity is exhibited by organism.	Organisms may change their niche with time and season.

18. Forests play a major role in regulating CO_2 level in atmosphere. As a result, Global warming induced.

- (i) **Carbon sink:** Forest act as carbon sink. Any system having the capacity to accumulate more atmospheric carbon during a given time interval than releasing CO_2 is called a carbon sink. Thus forests are ideal carbon sink since the trees utilize CO_2 for photosynthesis.
- (ii) **Carbon sequestration** is the process of capturing and storing CO_2 which reduces the amount of CO_2 in the atmosphere with a goal of reducing global climate change. Carbon sequestration is naturally done by green plants and in ocean.
- (iii) **Micro climate:** Trees provide micro climate for crops and maintain $\text{O}_2 - \text{CO}_2$ balance, atmospheric temperature and relative humidity. Thus forests play a major role in maintaining the climate.

19.



Structure of ovule

SECTION - 4

20. (a) (i) Single cell proteins are dried cells of microorganism that are used as protein supplement in human foods or animal feeds.
- (ii) Microorganisms used for the production of Single Cell Protein are as follows:
- (a) Bacteria - *Methylophilus methylotrophus*, *Cellulomonas*, *Alcaligenes*
 - (b) Fungi - *Agaricus campestris*, *Saccharomyces cerevisiae* (yeast), *Candida utilis*
 - (c) Algae - *Spirulina*, *Chlorella*, *Chlamydomonas*
- (iii) The single cell proteins forms an important source of food because of their protein content, carbohydrates, fats, vitamins and minerals. It is used by Astronauts and Antarctica expedition scientists.

Applications of Single-Cell Protein:

- (i) It is used as protein supplement.
- (ii) It is used in cosmetics products for healthy hair and skin.
- (iii) It is used as the excellent source of proteins for feeding cattle, birds, fishes etc.
- (iv) It is used in food industry as aroma carriers, vitamin carrier, emulsifying agents to improve the nutritive value of baked products, in soups, in ready-to-serve-meals, in diet recipes.
- (v) It is used in industries like paper processing, leather processing as foam stabilizers.

(OR)

- (b) The term millet is applied to a variety of very small seeds originally cultivated by ancient people in Africa and Asia. They are gluten free and have less glycemic index.

Types of Millets:

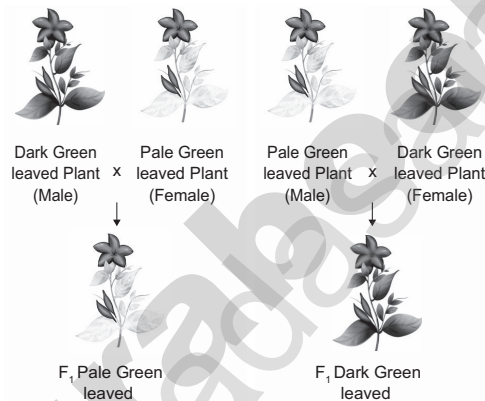
- (a) Finger Millet – Ragi
Botanical name : *Eleusine coracana*
- (b) Sorghum
Botanical name : *Sorghum vulgare*

Minor Millets :

- (a) Foxtail Millet
Botanical name : *Setaria italica*
- (b) Kodo Millet
Botanical name : *Paspalum scrobiculatum*

21. (a) **Chloroplast Inheritance :**

- (i) It is found in 4 O' Clock plant (*Mirabilis jalapa*).
- (ii) Two types of variegated leaves namely (i) Dark green leaved plants (ii) Pale green leaved plants.
- (iii) When pollen of dark green leaved plant (male) is transferred to the stigma of pale green leaved plant (female) and pollen of pale green leaved plant is transferred to the stigma of dark green leaved plant, the F_1 generation of both the crosses must be identical as per Mendelian inheritance.
- (iv) But in the reciprocal cross, the F_1 plant differs from each other.
- (v) In each cross, the F_1 plant reveals the character of the plant which is used as female plant.
- (vi) This inheritance is not through nuclear gene. It is due to the chloroplast gene found in the ovum of the female plant which contributes the cytoplasm during fertilization since the male gamete contribute only the nucleus but not cytoplasm.



Chloroplast inheritance

(OR)

(b) Formation of haploid microspores from diploid microspore mother cell through meiosis is called **Microsporogenesis**.

- (i) The primary sporogenous cells directly, or may undergo a few mitotic divisions to form **sporogenous tissue**.
- (i) The last generation of sporogenous tissue functions as microspore mother cells.
- (i) Each microspore mother cell divides meiotically to form a tetrad of four haploid microspores (microspore tetrad).
- (i) Microspores separate from one another and remain free in the anther locule and develop into pollen grains.
- (i) In some plants, all the microspores in a microsporangium remain held together called pollinium.

Example: *Calotropis*, Compound pollen grains are found in *Drosera* and *Drymis*.



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(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. In which techniques Ethidium Bromide is used?
 - (a) Polymerase Chain Reaction
 - (b) Southern Blotting Techniques
 - (c) Agarose Gel Electrophoresis
 - (d) Western Blotting Techniques

2. **Assertion :** Turmeric fights various kinds of cancer.

Reason : Curcumin is an anti-oxidant present in turmeric

- (a) Both **Assertion** and **Reason** are correct
 - (b) **Assertion** is correct, **Reason** is wrong
 - (c) Both **Assertion** and **Reason** are wrong
 - (d) **Assertion** is wrong, **Reason** is correct
3. In majority of the plants, pollen is liberated at :
 - (a) 3 celled stage
 - (b) 1 celled stage
 - (c) 4 celled stage
 - (d) 2 celled stage

4. Match the following :

(1) Totipotency	(i)	Reversion of mature cells into meristem
(2) Dedifferentiation	(ii)	Biochemical and structural changes of cell
(3) Explant	(iii)	Properties of living cells that develops into entire plant
(4) Differentiation	(iv)	Selected plant tissue transferred to culture medium

- (a) (1)-(ii), (2)-(i), (3)-(iv), (4)-(iii)
- (b) (1)-(iii), (2)-(i), (3)-(iv), (4)-(ii)
- (c) (1)-(iv), (2)-(ii), (3)-(iii), (4)-(i)
- (d) (1)-(i), (2)-(iii), (3)-(ii), (4)-(iv)

5. Read the following statements and fill up the blanks with correct option.

- (i) Total water content in soil is called _____
- (ii) Water not available to plants is called _____
- (iii) Water available to plants is called _____

	(i)	(ii)	(iii)
(a)	Chresard	Echard	Holard
(b)	Holard	Echard	Chresard
(c)	Holard	Chresard	Echard
(d)	Echard	Holard	Chresard

6. Coleorhiza is found in :

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

7. Which of the following are not regulating services of ecosystem services?

- (i) Genetic resources
- (ii) Recreation and aesthetic values
- (iii) Invasion resistance
- (iv) Climatic regulation

- (a) (i) and (ii)
- (b) (i) and (iii)
- (c) (i) and (iv)
- (d) (ii) and (iv)

8. Dihybrid test cross ratio is :

- (a) 1 : 2 : 1
- (b) 9 : 3 : 3 : 1
- (c) 1 : 1
- (d) 1 : 1 : 1 : 1

9. The International Ozone day is :

- (a) June 05
- (b) March 21
- (c) September 16
- (d) May 22

10. The active principle trans-tetra hydro canabinal is present in :

- (a) Marijuana
- (b) Opium
- (c) Andrographis
- (d) Curcuma

11. Dwarfing gene of wheat is :
 (a) Norin 10 (b) Pal I
 (c) Pelita 2 (d) Atomita I
12. One green house gas contributes 20% of total global warming and another contributes 60%. These are respectively identified as :
 (a) CH₄ and CO₂ (b) N₂O and CO₂
 (c) CH₄ and CFCs (d) CFCs and N₂O
13. Which Mendelian idea is depicted by a cross in which the F₁ generation resembles both the parents?
 (a) Inheritance of one gene
 (b) Incomplete dominance
 (c) Co-dominance
 (d) Law of dominance
14. Removal of introns and joining of exons in a defined order during transcription is called :
 (a) Inducing (b) Splicing
 (c) Slicing (d) Looping
15. Restriction enzymes are :
 (a) Not always required in genetic engineering.
 (b) Essential tool in genetic engineering.
 (c) Nucleases that cleave DNA at specific sites.
 (d) Both (b) and (c)

PART - II

Note : Answer **any six** questions. Question number **24** is compulsory. (6 × 2 = 12)

16. Name the chemicals used in gene transfer.
17. Give four examples of plants cultivated in commercial agroforestry.
18. What is phytoremediation?
19. Construct the food chain with the following data.
 Hawk, plants, frog, snake, grasshopper
20. What is back cross?

21. How do Dioscorea reproduces vegetatively?
22. Differentiate between primary introduction and secondary introduction.
23. What is the difference between missense and nonsense mutation?
24. Draw and label the parts of cut opened dicot seed.

PART - III

Note : Answer **any six** questions. Question number **33** is compulsory. (6 × 3 = 18)

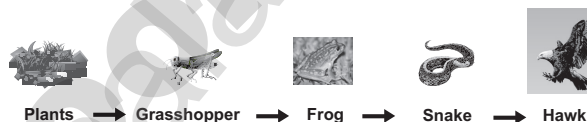
25. What is vivipary? Name a plant group which exhibits vivipary.
26. What are Agro chemicals?
27. Write the plants that are found in sub-alpine forests.
28. Write the salient features of Sutton and Boveri concept.
29. What are the advantages of seed dispersal?
30. A person got irritation while applying chemical dye. What would be your suggestion for alternative? Write its any two uses.
31. Compare the various types of Blotting techniques.
32. Name the seven contrasting traits studied by Mendel.
33. Write a short note on Sterilization of Explants in plant tissue culture.

PART - IV

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

34. (a) Mention the name of man-made cereal. How it is formed?
 (OR)
 (b) Describe dominant epistasis with an example.
35. (a) Enumerate the characteristic features of Entomophilous flowers.
 (OR)
 (b) Explain afforestation with case studies.

36. (a) What is soil profile? Explain about the different soil horizons.
(OR)
(b) List the ways by which seeds can be stored for longer duration.
37. (a) Write in detail about the protocol for artificial seed preparation and its advantages
(OR)
(b) Write the steps involved in recombinant DNA technology.
38. (a) Tabulate the differences between primary and secondary succession.
(OR)
(b) Explain the DNA replication in eukaryotes.
17. The major species cultivated in commercial Agroforestry include
(i) *Casuarina*
(ii) *Eucalyptus*
(iii) Malai Vembu
(iv) Teak and Kadambu trees.
18. (i) Rice and *Eichhornia* (water hyacinth) tolerate cadmium by binding it to their proteins.
(ii) These plants otherwise can also be used to remove cadmium from contaminated soil, this is known as Phytoremediation.
- 19.



Plants → Grasshopper → Frog → Snakes → Hawks
Producers Primary Secondary Tertiary Top
consumers consumers consumers carnivores

1. (c) Agarose Gel Electrophoresis
2. (a) Both **Assertion** and **Reason** are correct
3. (d) 2 celled stage
4. (b) (1)-(iii), (2)-(i), (3)-(iv), (4)-(ii)
5. (b) (i) -Holard, (ii) -Echard, (iii) -Chresard
6. (b) Paddy
7. (a) (i) and (ii)
8. (d) 1 : 1 : 1 : 1
9. (c) September 16
10. (a) Marijuana
11. (a) Norin 10
12. (a) CH₄ and CO₂
13. (c) Co-dominance
14. (b) Splicing
15. (d) Both (b) and (c)
16. (i) Polyethylene glycol.
(ii) Dextran sulphate.
20. Back cross is a cross of F₁ hybrid with any one of the parental genotypes. It is two types; they are
(1) dominant back cross
(2) recessive back cross.
21. *Dioscorea* reproduces vegetatively by means of bulbils.
- 22.
- | | 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. |

ANSWERS

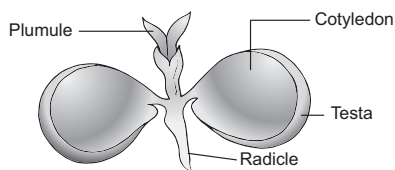
PART - I

PART - II

23.

	Missense mutation	Non-sense mutation
1.	The mutation where the codon for one amino acid is changed into a codon for another amino acid	The mutations where codon for one amino acid is changed into a termination or stop codon
2.	Change in amino acid encoded.	Creates translational termination codon (UAA, UAG or UGA)

24.



Seed cut opened

PART - III

25. (i) Vivipary is a special type of seed germination.
- (ii) When seeds or embryos begin to develop before they detach from the parent. The phenomenon is described as vivipary.
- (iii) Seeds germinate in the fruits of mother plant itself.
- (iv) Halophytes is a plant group which exhibits vivipary.

Example : *Avicennia*.

26. (i) An agro-chemical is useful in managing agriculture or in farming area which is one of the major issues of the environment.
- (ii) Agro-chemicals includes fertilizers, liming and acidifying agents, soil conditioners, pesticides and chemicals used in animal husbandry, such as antibiotics and hormones.

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

28. Sutton and Boveri (1903) independently proposed the chromosome theory of inheritance.

Salient features of the Chromosomal theory of inheritance:

- (i) Somatic cells of organisms are derived from the zygote by repeated cell division (mitosis). These consist of two identical sets of chromosomes. One set is received from female parent (maternal) and the other from male parent (paternal). These two chromosomes constitute the homologous pair.
- (ii) Chromosomes retain their structural uniqueness and individuality throughout the life cycle.
- (iii) Each chromosome carries specific determiners or Mendelian factors which are now termed as genes.
- (iv) The behaviour of chromosomes during the gamete formation (meiosis) provides evidence to the fact that genes or factors are located on chromosomes.

29. **Advantages of seed dispersal:**

- (i) Seeds escape from mortality near the parent plants due to predation by animals or getting diseases.
- (ii) Dispersal also gives a chance to occupy favourable sites for growth.
- (iii) It is an important process in the movement of plant genes. Particularly this is the only method available for self-fertilized flowers and maternally transmitted genes in out crossing plants.
- (iv) Seed dispersal by animals help in conservation of many species even in human altered ecosystems.
- (v) It acts as a key for proper functioning and establishment of many ecosystems from deserts to evergreen forests. It used for maintenance of biodiversity conservation and restoration of ecosystems.

30. (i) Henna is the best alternative natural dye.
 (ii) An orange dye 'Henna' is obtained from the leaves and young shoots of *Lawsonia inermis*.
 (iii) The principal colouring matter of leaves 'lacosone" is harmless and causes no irritation to the skin.
 (iv) It is used to dye skin, hair and finger nails.

31. **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

32.

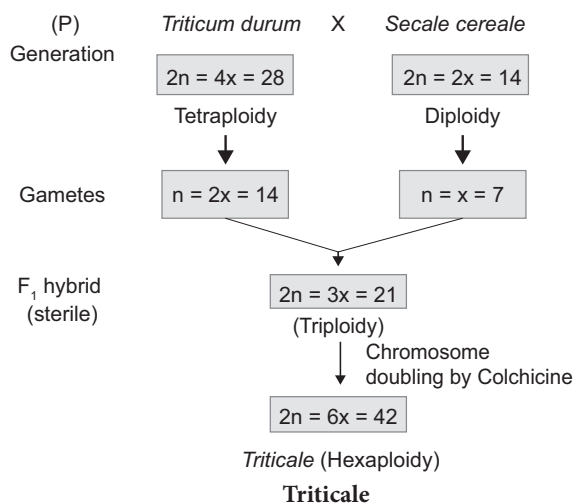
	Character	Dominate Traits	Recessive Traits
1.	Stem length	Tall	Dwarf
2.	Pod shape	Inflated	Constricted
3.	Seed shape	Round	Wrinkled
4.	Seed colour	Yellow	Green
5.	Flower position	Axial	Terminal
6.	Flower Color	Purple	White
7.	Pod color	Green	Yellow

33. **Sterilization of Explants:** The plant materials to be used for tissue culture should be surface sterilized by first exposing the material in running tap water and then treating it in surface sterilization agents like 0.1% mercuric chloride, 70% ethanol under aseptic condition inside the Laminar Air Flow Chamber.

PART - IV

34.(a) Triticale is the successful first man made cereal. Depending on the ploidy level.

Formation of triticale:



Triticale can be divided into three main groups:

- (i) **Tetraploidy:** Crosses between diploid wheat and rye.

(ii) **Hexaploidy:** Crosses between tetraploid wheat *Triticum durum* (macaroni wheat) and rye.

(iii) **Octoploidy:** Crosses between hexaploid wheat *T. aestivum* (bread wheat) and rye.

Hexaploidy Triticale hybrid plants demonstrate characteristics of both macaroni wheat and rye. For example, they combine the high-protein content of wheat with rye's high content of the amino acid lysine, which is low in wheat.

Colchicine, an alkaloid applied in low concentration to the growing tips of the plants to induce polyploidy

(OR)

(b) **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).
- 35.(a) Flowers are generally large or if small, they are aggregated in dense inflorescence.

Examples: Asteraceae flowers.

- (i) 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.
- (ii) Flowers are scented and produce nectar.
 - (iii) 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.
 - (iv) Flowers pollinated by flies and beetles produce foul odour to attract pollinators.
 - (v) In some flowers juicy cells are present which are pierced and the contents are sucked by the insects.

(OR)

- (b) Afforestation is planting of trees where there was no previous tree coverage and the conversion of non-forested lands into forests by planting suitable trees to retrieve the vegetation. **Example:** Slopes of dams afforested to reduce water run-off, erosion and siltation. It can also provide a range of environmental services including carbon sequestration, water retention.

Tamil Nadu Afforestation Project (TAP):

- (i) With an aim of ecological restoration and biological up-gradation of degraded forests and other lands, the government of Tamil Nadu launched the project in 2 phases.
- (ii) Tap I (1997-2005) it aimed to uplift the quality and life of villagers abutting forest areas and to resolve the degraded forests in Tamil Nadu. This is a massive Joint Forest Management Programme.

TAP II (2005-2013) had 2 main objectives.

- (i) To restore the ecological equilibrium of the forests, watersheds and adjacent villages of Tamil Nadu.
- (ii) To improve the quality of the life of inhabitants through reforestation, water conservation and sustained community action.

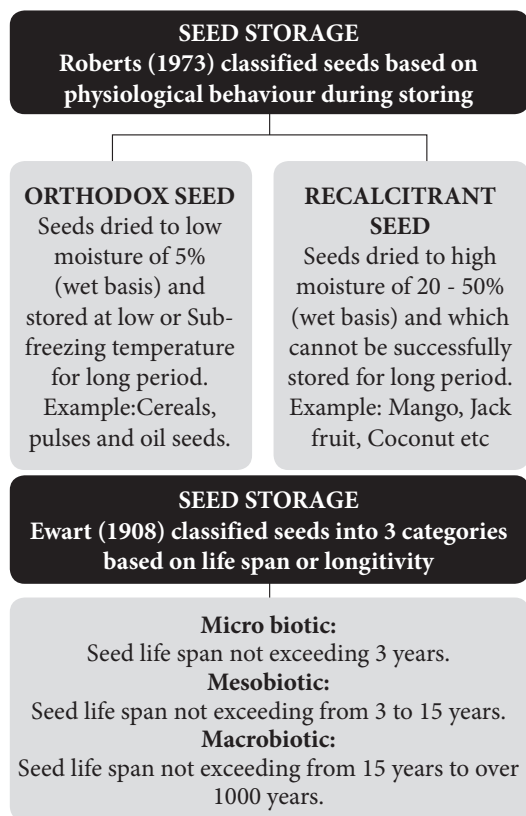
36.(a) Soil is commonly stratified into horizons at **different depth**. These layers differ in their physical, chemical and biological properties. This succession of **super-imposed horizons** is called **soil profile**.

Characters of different soil horizons:

Horizon	Description
O-Horizon (Organic horizon) Humus	It consists of fresh or partially decomposed organic matter. O1 - Freshly fallen leaves, twigs, flowers and fruits O2 - Dead plants, animals and their excreta decomposed by micro-organisms. Usually absent in agricultural and deserts.
A-Horizon (Leached horizon) Topsoil - Often rich in humus and minerals.	It consists of top soil with humus, living creatures and inorganic minerals. A1 - Dark and rich in organic matter because of mixture of organic and mineral matters. A2 - Light coloured layer with large sized mineral particles.
B-Horizon (Accumulation horizon) (Subsoil-Poor in humus, rich in minerals)	It consists of iron, aluminium and silica rich clay organic compounds.
C - Horizon (Partially weathered horizon) Weathered rock Fragments - Little or no plant or animal life.	It consists of parent materials of soil, composed of little amount of organic matters without life forms.
R - Horizon (Parent material) Bedrock	It is a parent bed rock upon which underground water is found.

(OR)

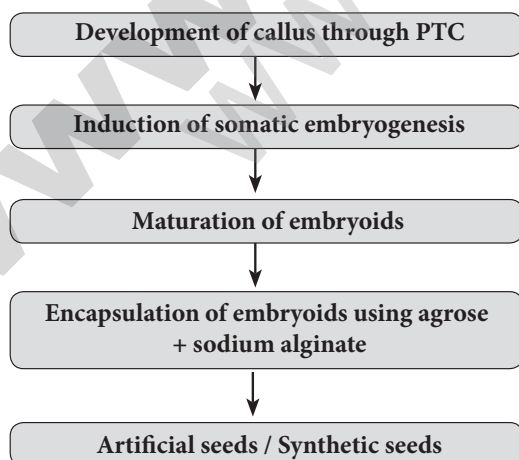
(b)



Also there are other methods of seed storage. They are:

- (i) Conventional Methods of Seed Storage.
- (ii) Modern Methods of Seed Storage.
 - (a) Seed storage in cryopreservation .
 - (b) Seed storage in gene bank.
 - (c) Svalbard seed bank

37. (a) Protocol for Artificial seed preparation :



Advantages of artificial seeds :

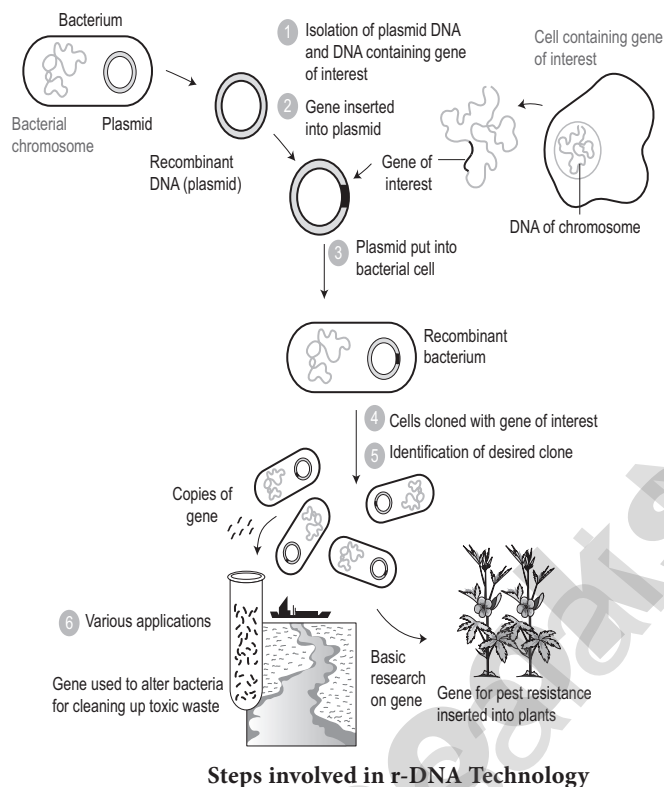
Artificial seeds have many advantages over the true seeds.

- (i) Millions of artificial seeds can be produced at any time at low cost.
- (ii) They provide an easy method to produce genetically engineered plants with desirable traits.
- (iii) It is easy to test the genotype of plants.
- (iv) They can potentially stored for long time under cryopreservation method.
- (v) Artificial seeds produce identical plants.
- (vi) The period of dormancy of artificial seeds is greatly reduced, hence growth is faster with a shortened life cycle.

(OR)

(b) The steps involved in recombinant DNA technology are :

- (i) Isolation of a DNA fragment containing a gene of interest that needs to be cloned. This is called an insert.
- (ii) Generation of recombinant DNA (rDNA) molecule by insertion of the DNA fragment into a carrier molecule called a vector that can self-replicate within the host cell.
- (iii) Selection of the transformed host cells that is carrying the rDNA and allowing them to multiply thereby multiplying the rDNA molecule.
- (iv) The entire process thus generates either a large amount of rDNA or a large amount of protein expressed by the insert.
- (v) Wherever vectors are not involved, the desired gene is multiplied by PCR technique. The multiple copies are injected into the host cell protoplast or it is shot into the host cell protoplast by shot gun method.

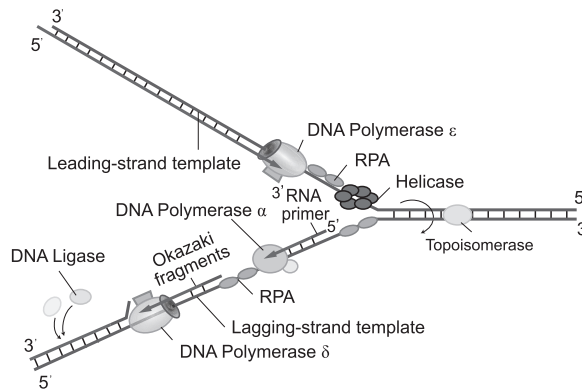


38. (a)

Sl. No.	Primary succession	Secondary succession
1.	Developing in an barren area	Developing in disturbed area
2.	Initiated due to a biological or any other external factors	Starts due to external factors only
3.	No soil, while primary succession starts	It starts where soil covers is already present
4.	Pioneer species come from outside environment	Pioneer species develop from existing environment
5.	It takes more time to complete	It takes comparatively less time to complete

(OR)

- (b) (i) Replication starts at a specific site on a DNA sequence known as the origin of replication. Multiple origin of replication found in eukaryotes.
- (ii) DNA replication in eukaryotes starts with the assembly of a prereplication complex (preRC) consisting of 14 different proteins.)
- (iii) The origin of replication in yeast is called as ARS sites (Autonomously Replicating Sequences).



Eukaryotic replication fork

- (iv) Replication fork is the site (point of unwinding) of separation of parental DNA strands where new daughter strands are formed. Multiple replication forks are found in eukaryotes.

Enzyme involved in replication:

- (i) **Helicases:** involved in unwinding of DNA by breaking hydrogen bonds holding the two strands of DNA
- (ii) **Replication protein A (RPA):** Prevents the reattachment of separated polynucleotide strand.
- (iii) **Topoisomerase:** Breaks DNAs covalent bonds and removes positive supercoiling ahead of replication fork.
- (iv) **DNA polymerase α / primase:** Initiates DNA replication which synthesizes short stretch of RNA primers on both leading strand (continuous DNA strand) and lagging strands (discontinuous DNA strand).
- (v) **Primers:** Needed because DNA polymerase requires a free 3' OH to initiate synthesis. DNA polymerase covalently connects the nucleotides at the growing end of the new DNA strand.

DNA Pol α (alpha), DNA Pol δ (delta) and DNA Pol ε (Epsilon) are the 3 enzymes involved in nuclear DNA replication.

- (vi) **DNA Pol α** – Synthesizes short primers of RNA.
- (vii) **DNA Pol δ** – Main replicating enzyme of cell nucleus.
- (viii) **DNA Pol ε** – Extend the DNA Strands in replication fork.
- (ix) **DNA ligase:** Joins any nicks in the DNA by forming a phosphodiester bond between 3' hydroxyl and 5' phosphate group.

