DIRECTORATE OF GOVERNMENT EXAMINATIONS CHENNAI – 6
HIGHER SECONDARY SECOND YEAR EXAMINATION – MARCH – 2024
KEY ANSWER FOR BOTANY

Note :

1. Answer written only in BLACK or BLUE should be evaluated.
2. Choose the correct answer and write the option code with corresponding Answer

Maximum marks : 70

PART – I

Answer all questions **15×1 =15**

TYPE – A			TYPE - B		
1	b	Paddy	1	c	Agarose Gel Electrophorosis
2	b	1-(iii), (2)-(i), (3)-(iv), (4)-(ii)	2	a	Both Assertion and Reason are correct
3	a	(i) and (ii)	3	d	2 Celled stage
4	b	Splicing	4	b	1-(iii), (2)-(i), (3)-(iv), (4)-(ii)
5	d	2 Celled stage	5	b	Holard, Echard, Chresard
6	b	Holard, Echard, Chresard	6	b	Paddy
7	a	Both Assertion and Reason are correct	7	a	(i) and (ii)
8	c	Co-dominance	8	d	1 : 1: 1: 1
9	a	Norin 10	9	c	September 16
10	d	1 : 1: 1: 1	10	a	Marijuana
11	d	Both (b) and (c)	11	a	Norin 10
12	c	September 16	12	a	CH_4 and Co_2
13	c	Agarose Gel Electrophorosis	13	c	Co-dominance
14	a	CH_4 and Co_2	14	b	Splicing
15	a	Marijuana	15	d	Both (b) and (c)

PART – II

Answer any six questions. **6×2=12**
Question No. 24 is compulsory.

Q.No	Answer	Marks
16	1. Polyethylene glycol (or) PEG 2. Dextran sulphate	1 1
17	1. Casuarina 2. Eucalyptus 3. Malai vembu 4. Teak 5. Kadambu — Any Four (4 x½)	2

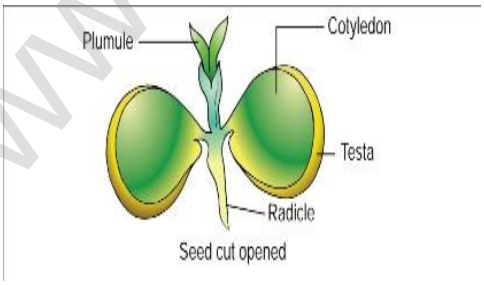
<table>
<tr><td>18</td><td>Use of plants to bring about remediation of environmental pollutants.
Or
Use of certain plants to remove contaminants or pollutants from the environment (soil, water or air).
Or
Rice and Eichhornia (water hyacinth) tolerate cadmium by binding it to their proteins.These plants otherwise can also be used to remove cadmium from contaminated soil ,this is known as Phytoremediation.</td><td>2</td></tr>
<tr><td>19</td><td>Plants ⟶ Grasshopper ⟶ Frog ⟶ Snake ⟶ Hawk</td><td>2</td></tr>
<tr><td>20</td><td>Back cross is a cross of F_1 hybrid with any one of the parental genotypes.
(Or)
Crosses between F1 off – springs with either of the two parents (hybrid) are known as back cross.</td><td>2</td></tr>
<tr><td>21</td><td>Bulbil</td><td>2</td></tr>
<tr><td>22</td><td><table><tr><th>Primary Introduction</th><th>Secondary Introduction</th></tr><tr><td>When the Introduced variety is well adapted to the new environment without any alternation to the original genotype</td><td>When the Introduced variety is subjected to selection to isolate a superior variety and hybridized with a local variety to transfer one or a few characters to them.</td></tr></table></td><td>2</td></tr>
<tr><td>23</td><td><table><tr><th>Missense Mutation</th><th>Nonsense Mutation</th></tr><tr><td>Change in amino acid encoded</td><td>Creates translational termination codon (UAA, UAG or UGA)</td></tr><tr><td colspan="2">(Or)</td></tr><tr><th>Missense Mutation</th><th>Nonsense Mutation</th></tr><tr><td>Mutation where the codon for one amino acid is changed into a codon for another amino acid is called mis sence mutation</td><td>Mutation where the codon for one amino acid is changed into a termination or stop codon is called Nonsense mutation.</td></tr></table></td><td>2</td></tr>
<tr><td>24</td><td> 

Diagram
Parts Any Two</td><td>1
1</td></tr>
</table>

PART – III

Answer any six of the following **6×3=18**

Question Number **33** is compulsory

Q.No	Answer	Marks
25	1. Seed germinate in the fruits while on the mother plant is called vivipary 2. It occurs in Halophytic plants	2 1
26	An agro-chemical is useful in managing agriculture or in farming area which is one of the major issues of the environment. Agro-chemicals includes fertilizers, liming and acidifying agents, soil conditioners, pesticides and chemicals used in animal husbandry, such as antibiotics and hormones.	3
27	Abies, Pinus, Betula, Quercus, salix, Rhododendron, Orchids, mosses and Lichens (Any Three)	3
28	1. 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. 2. Chromosomes retain their structural uniqueness and individuality throughout the life cycle of an organism. 3. Each chromosome carries specific determiners or Mendelian factors which are now termed as genes. 4. The behaviour of chromosomes during the gamete formation (meiosis) provides evidence to the fact that genes or factors are located on chromosomes. **(Any Three)**	3
29	**Advantages of seed dispersal;-** 1. Seeds escape from mortality near the parent plants due to predation by animals or getting diseases and also avoiding competition. 2. Dispersal also gives a chance to occupy favourable sites for growth. 3. 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 outcrossing plants. 4. Seed dispersal by animals help in conservation of many species even in human altered ecosystems. 5. Understanding of fruits and seed dispersal acts as a key for proper functioning and establishment of many ecosystems from deserts to evergreen forests and also for the maintenance of biodiversity conservation and restoration of ecosystems. **(Any Three)**	3
30	My suggestion for alternative dye is Henna (or) Lawsonia inermis. **Uses;-** 1. Henna dye has long been used to dye skin, hair and finger nails. 2. It is used for colouring leather, for the tails of horses and hair – dyes. 3. The principle colouring matter of leaves lacosone is harmless and cause no irritation to the skin. **(Any Two)**	1 2

31

Differences between Blotting Techniques

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

(Any Three Differences) — 3

32

	Charecter	Dominant trait	Recessive trait
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 colour	Purple	White
7	Pod colour	Green	Yellow

3

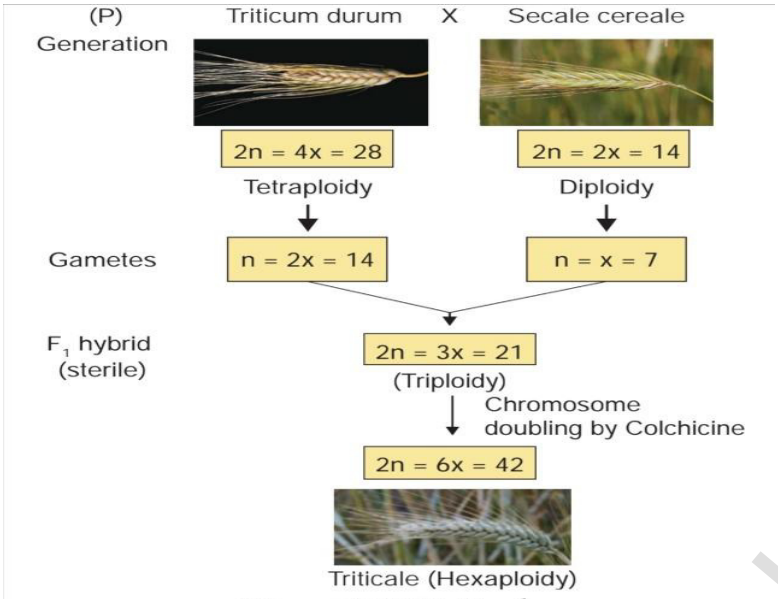
33 — 3

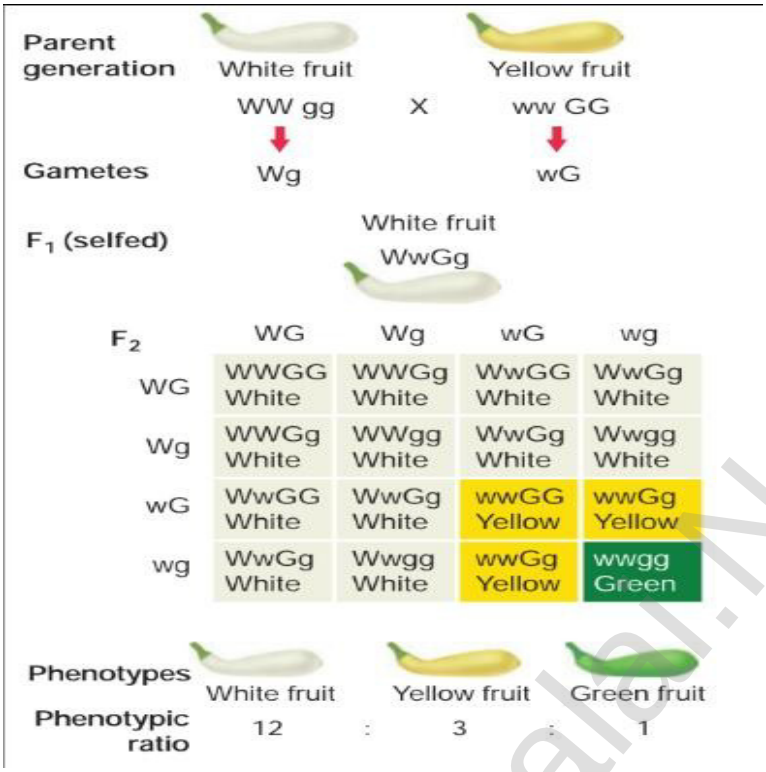
Sterilization of Explants:

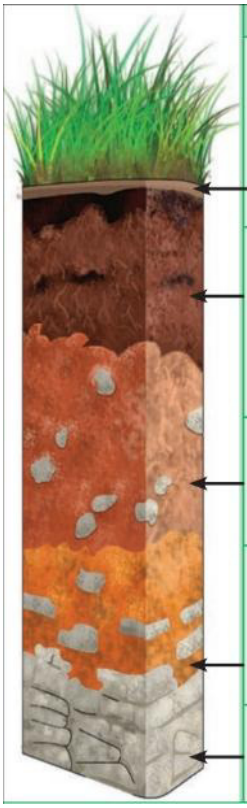
The plant materials to be used for tissue culture should be surface sterilized by first exposing the material in running tap water and then treating it in surface sterilization agents like 0.1% mercuric chloride, 70% ethanol under aseptic condition inside the Laminar Air Flow Chamber.

PART – IV

Answer all questions **5×5=25**

34.a	Triticale.  	1 4
	(OR)	
34.b	**Dominant Epistasis -** 1. 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. The gene that suppresses or masks the phenotypic expression of a gene at another locus is known as epistatic. 2. **In the summer squash** the fruit colour locus has a dominant allele 'W' for whitecolour and a recessive allele 'w' for coloured fruit. 'W' allele is dominant that masks the expression of any colour. In another locus hypostatic allele 'G' is for yellow fruit and its recessive allele 'g' for green fruit. 3. In the first locus the white is dominant to colour where as in the second locus yellow is dominant to green. 4. When the white fruit with genotype WWgg is crossed with yellow fruit with genotype wwGG, the F_1 plants have white fruit and are heterozygous (WwGg). 5. When F_1 heterozygous plants are crossed they give rise to F_2 with the phenotypic ratio of 12 white : 3 yellow: 1 green. 6. Since W is epistatic to the alleles 'G' and 'g, the white which is dominant, masks the effect of yellow or green. 7. Homozygous recessive ww genotypes only can give the coloured fruits (4/16). Double recessive 'wwgg' will give green fruit (1/16). The Plants having only 'G' in its genotype (wwGg or wwGG) will give the yellow fruit(3/16).	2

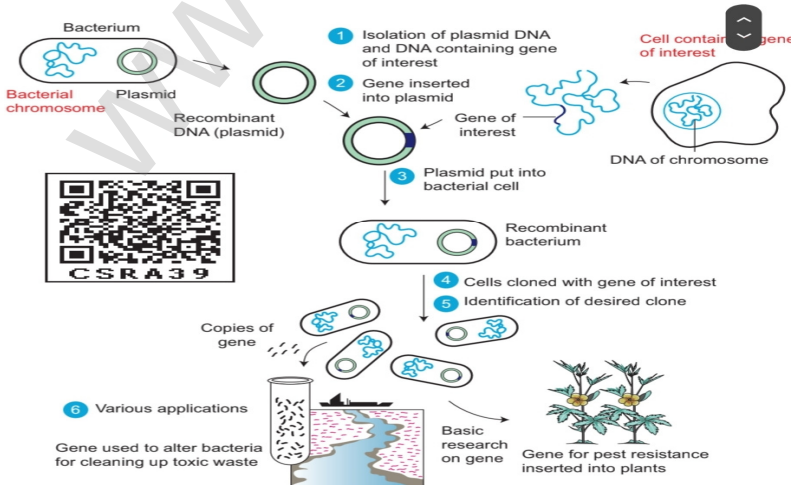
	Eg: **summer squash**  	1 2
35.a	**characteristic features of entomophilous flowers are as follows:** 1. Flowers are generally large or if small they are aggregated in dense inflorescence. 2. Flowers are brightly coloured. The adjacent parts of the flowers may also be brightly coloured to attract insect. 3. Flowers are scented and produce nectar. 4. Flowers in which there is no secretion of nectar, the pollen is either consumed as food or used in building up of its hive by the honeybees. Pollen and nectar are the floral rewards for the visitors. 5. Flowers pollinated by flies and beetles produce foul odour to attract pollinators. 6. In some flowers juicy cells are present which are pierced and the contents are sucked by the insects. **(Any Five)**	5
	(OR)	
35.b	**Afforestation** The Conservation of non – forested lands into forests. **Case study;-** **Tamil Nadu Afforestation Project (TAP)** 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 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.**	1 2

	1. To restore the ecological equilibrium of the forests, watersheds and adjacent villages of Tamil Nadu. 2. To improve the quality of the life of inhabitants through reforestation, water conservation and sustained community action.	2
36.a	**Soil Profile;-** 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. 	2 3

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 in-organic 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)

36.b	**a. Seed storage in cryopreservation:** It is the technique of germplasm conservation (storage of cells, tissue, embryo or seeds) by ultra-low temperature in liquid nitrogen at -196°C. It is not practical for commercial seed storage purpose, but is useful to store the valuable germplasm for use in future which cannot be preserved by conventional methods. **b. Seed storage in gene bank:** In gene bank, seed storage is the preservation of seed under controlled environmental condition which will prolong the viability of the seeds for long periods. The temperature, relative humidity and seed moisture content. Containers and distribution arrangement vary for each and every type of seed. **c. Svalbard seed bank:** The seeds are stored in four ply sealed envelopes, and then placed into plastic tote containers on metal shelving racks. The storage rooms are kept at -18°C. The low temperature and limited access to O_2 will ensure low metabolic activity and delayed seed ageing. The permafrost surrounding will help to maintain low temperature of the seed when the electricity supply fails.	2 1 2
37.a	1. Artificial seeds or synthetic seeds (synseeds) are produced by using	

	embryoids (somatic embryos) obtained through in vitro culture. They may even be derived from single cells from any part of the plant that later divide to form cell mass containing dense cytoplasm, large nucleus, starch grains, proteins, and oils etc.,	1
	2. To prepare the artificial seeds different inert materials are used for coating the somatic embryoids like agarose and sodium alginate.	1
	Advantages of Artificial seeds 1. Artificial seeds have many advantages over the true seeds 2. Millions of artificial seeds can be produced at any time at low cost. 3. They provide an easy method to produce genetically engineered plants with desirable traits. 4. It is easy to test the genotype of plants. 5. They can potentially stored for long time under cryopreservation method. 6. Artificial seeds produce identical plants 7. The period of dormancy of artificial seeds is greatly reduced, hence growth is faster with a shortened life cycle. **(Any Three)**	3
	(OR)	
37.b	**Steps involved in recombinant DNA technology :-** 1. Isolation of a DNA fragment containing a gene of interest that needs to be cloned. This is called an insert. 2. 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. 3. Selection of the transformed host cells is carrying the rDNA and allowing them to multiply thereby multiplying the rDNA molecule. 4. The entire process thus generates either a large amount of rDNA or a large amount of protein expressed by the insert. 5. 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. (Or) Diagram with its steps  	5

38.a

	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

5

(OR)

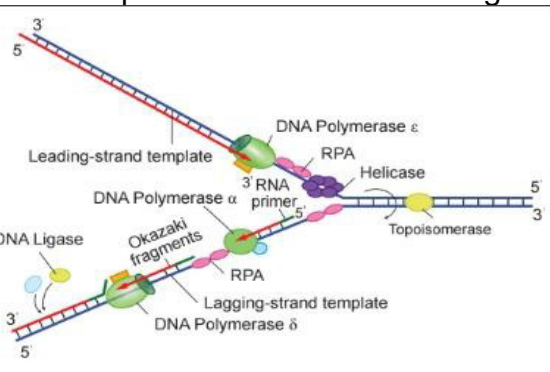
38.b

Eukaryotic DNA replication;-

1. Replication starts at a specific site on a DNA sequence known as the Origin of replication.
2. DNA replication in eukaryotes starts with the assembly of a prereplication complex (preRC) consisting of 14 different proteins.
3. Replication fork is the site (point of unwinding) of separation of parental DNA strands where new daughter strands are formed.
4. The enzyme helicases are involved in unwinding of DNA by breaking hydrogen bonds holding the two strands of DNA.
5. Replication protein A (RPA) prevents the separated polynucleotide strand from getting reattached.
6. Topoisomerase is an enzyme which breaks DNAs covalent bonds and removes positive supercoiling ahead of replication fork. It eliminates the torsional stress caused by unwinding of DNA double helix.
7. DNA replication is initiated by an enzyme DNA polymerase α / primase which synthesizes short stretch of RNA primers on both leading strand (continuous DNA strand) and lagging strands (discontinuous DNA strand). Primers are 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.
8. DNA Pol α(alpha), DNA Pol δ (delta) and DNA Pol ε (Epsilon) are the 3 enzymes involved in nuclear DNA replication.

5

9. DNA Synthesis takes place in 5'→ 3' direction and it is semi discontinuous. When DNA is synthesized in 5' → 3' direction, only in the free 3' end (OH end) DNA is elongated. In 1960s Reiji Okazaki and his colleagues found out that one of the new DNA strands is synthesized in short pieces called Okazaki fragments.



Explanation - 3 marks

Diagram with any four parts - 2 marks