Higher Secondary Second year First Revision Test - 2022
Botany – Key Answer

I. **Answer All the questions** **15 x 1=15**

Q. NO	Part - I		Marks
1	c)	Eichhornia crassipes	1
2	d)	Murraya	1
3	b)	Calotropis	1
4		Mere Attempt	1
5	a)	Antirrhinum	1
6	b)	12:3:1	1
7	d)	None of the above	1
8	c)	1:7:7:1	1
9	c)	Helianthus	1
10	d)	AUG	1
11	d)	Seed	1
12	d)	Nucellus - Perisperm	1
13	d)	Four	1
14	c)	Barbara McClintock	1
15	b)	Introns	1

II. Answer any six questions. Question No. 24 is Compulsory. **6 x 2 =12**

Part - II

16. Pollenkitt — 2

- Pollenkitt is an oily layer forming a thick viscous coating over pollen surface.
- Pollenkitt is contributed by the tapetum and coloured yellow or orange and is chiefly made of carotenoids or flavonoids.
- It attracts insects and protects damage from UV radiation.

17. Cantharophily — 2

- Pollination takes place by beetle is called cantharophily.

18. Differentiate continuous variation with discontinuous variation. (Any 2 Points) — 2

S.NO	Continuous Variation	Discontinuous Variation
1	This variation due to the combining effects of environmental and genetic factors	This variations are genetically determined by inheritance factors.
2	The phenotype is determined by many genes, and environmental factors.	The phenotypic expression is unaffected by environmental conditions.
3	Directions of continuous variations is predictable.	Directions of discontinuous variations is unpredictable.
4	This is also called as quantitative inheritance	This is also called as qualitative inheritance.
5	Ex : Human height and skin colour	Ex : Style length in primula plant height of garden pea.

19. Back cross — 2

- Back cross is a cross of F_1 hybrid with any one of the parental genotypes.

20. Lethal allele — 2

- An allele which has the potential to cause the death of an organism is called lethal allele.
- Ex : Snapdragon

21. **Gene mapping** — 2

- The diagrammatic representation of position of genes and related distances between the adjacent genes is called gene mapping.

22. **Capping** — 2

- Modification at the 5' end of the primary RNA transcript (hnRNA) with methylguanosine triphosphate is called capping.

23. **Characters of anemophilous plant. (Any 2 Points)** — 2

- Flowers in pendulous, catkin like or spike inflorescence.
- The perianth is absent or highly reduced.
- The flowers are small, colourless, not scented, do not secrete nectar.
- The stamens are numerous, filaments are long, exerted and versatile.
- Enormous quantity of pollen grains. Compared to number of ovules available for pollination.
- Minute, light, dry pollen easily carried by wind to long distances.

24. **Pleitropic genes** — 2

- The single gene affects multiple traits and alter the phenotype of the organism. This Pleitropic gene influences a number of characters simultaneously and such genes are called pleitropic genes.

PART - III

Any six questions. Question No. 33 is Compulsory — **6 x 3 =18**

25. **Functions of tapetum (Any 3 points)** — 3

- It supplies nutrition to the developing microspores
- It contributes sporopollenin through ubisch bodies thus plays an important role in pollen wall formation.
- The pollenkitt material is contributed by tapetal cells and is later transferred to the pollen surface.
- Exine proteins responsible for rejection reaction of the stigma are present in the cavities of the exine. These proteins are derived from tapetal cells.

26. **Types of endosperm**

- Nuclear endosperm — 1
- Cellular endosperm — 1
- Helobial endosperm — 1

27. **Polyembryony** — 3

- Presence of more than one embryo in a seed is called polyembryony.

28. **Dominant epistasis** — 3

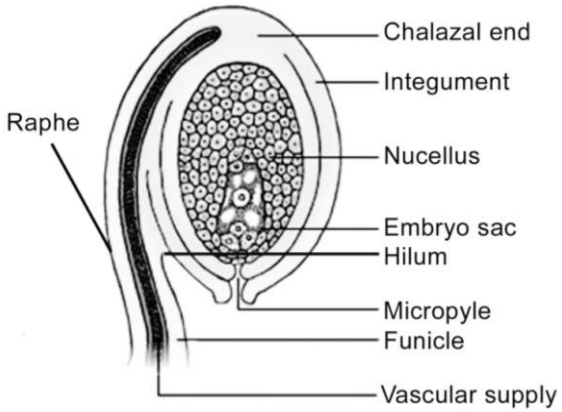
- It is a gene interaction in which two alleles of a gene at one locus interfere and suppress or mask the phenotypic expression of a different pair of alleles of another gene at another locus. The gene that suppresses or masks the phenotypic expression of a gene at another locus is known as epistatic.

29. **Co dominance** — 3

- The phenomenon in which two alleles are both expressed in the heterozygous individual is known as co dominance.

30. **Linkage differ from crossing over**

	Linkage	Crossing over	
1	The genes present on chromosome Stay close together.	It leads to separation of linked genes	1
2	It involves same chromosome of homologous chromosome.	It involves exchange of segments between non-sister chromatids of homologous chromosome.	1
3	It reduces new gene combinations	It increases variability by forming new gene Combinations. lead to formation of new Organism	1

31.	**Recombination** ➢ In this, segments of DNA are broken and recombined to produce new combinations of alleles. This process is called Recombination.	3
32.	**Significance of RNA Editing** ➢ In higher plant chloroplast, it helps to restore the codons for conserved amino acids which include initiation and termination codon. ➢ It regulates Organellar gene expression in plants. ➢ RNA editing results in the restoration of codons for phylogenetically conserved amino acid residues.	1 1 1
33.	**Ovule - structure**  	**Diagram - 2** **Parts - 1**
	Part – IV **Answer all the questions**	5 x 5=25
34.	**Types of ovules.** ➢ The ovules are classified into six main types. they are **Orthotropous** ➢ The micropyle is at the distal end. ➢ The micropyle, the funicle and the chalaza lie in one straight vertical line. ➢ Ex : Piperaceae, Polygonaceae. **Anatropous** ➢ The body of the ovule completely inverted. ➢ The micropyle and funiculus come to lie very close to each other. ➢ Ex : Dicots and monocots. **Hemianatropous** ➢ The body of the ovule is placed transversely and at right angles to the funicle. ➢ Ex: Primulaceae. **Campylotropous** ➢ The body of the ovule at the micropylar end is curved and more or less bean shaped. ➢ The embryo sac is slightly curved. ➢ Hilum, micropyle and chalaza are adjacent to one another. ➢ Ex : Leguminosae **Amphitropous** ➢ The distance between hilum and chalaza is less. ➢ The curvature of the ovule leads to horse - shoe shaped nucellus. ➢ Ex : some Alismataceae. **Circinotropous** ➢ Funiculus is very long and surrounds the ovule. ➢ Ex : Cactaceae.	4

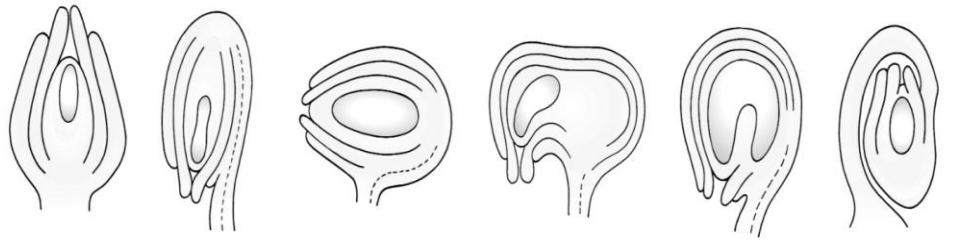


Diagram – 1

34. (OR)

Parthenocarpy

- Formation of fruit from the ovary without fertilization is called parthenocarpic fruits. — **2**
- Ex : Banana, Grapes and Papaya.

Significance parthenocarpic fruits

- The seedless fruits have great significance in horticulture. — **1**
- The seedless fruits have great commercial importance. — **1**
- They are useful for the preparation of jams, jellies, sauces, fruit drinks. — **1**
- High proportion of edible part is available in parthenocarpic fruits due to the absence of seeds.

35.

Name the seven contrasting traits of Mendel. — **5**

S.NO	Character	Dominant	Recessive
1.	Plant height	Tall	Dwarf
2.	Flower position	Axial	Terminal
3.	Flower colour	Purple	White
4.	Pod form	Inflated	Constricted
5.	Pod colour	Green	Yellow
6.	Seed shape	Round	Wrinkled
7.	Cotyledon colour	Yellow	Green

35. (OR)

Incomplete dominance — **1**

- When one allele is not completely dominant to another allele it shows incomplete dominance.

Parent **Red** R^1R^1 **White** R^2R^2

Gametes R^1 R^2

F_1 = R^1R^2 **(pink colour)**

F_1 **(Selfed)** = R^1R^2 x R^1R^2 — **3**

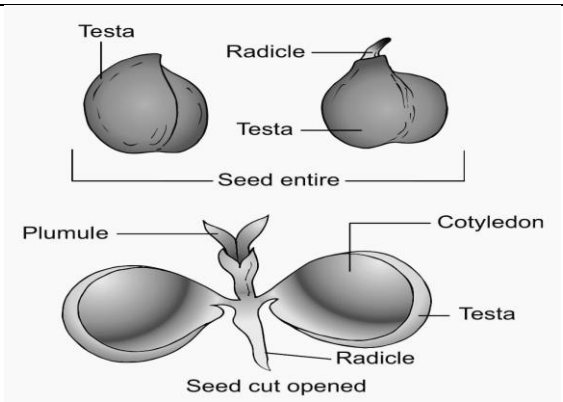
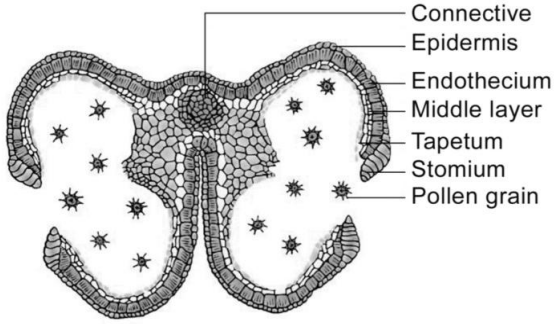
F_2 =

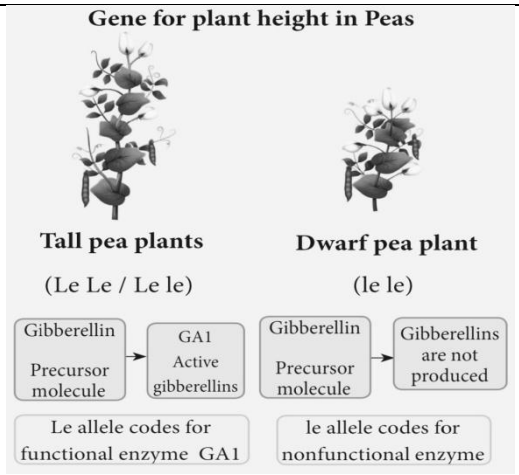
Gametes	R^1	R^2
R^1	R^1R^1 Red	R^1R^2 Pink
R^2	R^1R^2 Pink	R^2R^2 White

Phenotypes : R^1R^1 R^1R^2 R^2R^2

Phenotypic Ratio : 1 : 2 : 1 — **1**

	(OR Explaination) ➢ When one allele is not completely dominant to another allele it shows incomplete dominance. ➢ Carl correns's experimented in 4 o' clock plant Mirabilis jalapa. ➢ The homozygous red (R^1R^1) parent is crossed with white (R^2R^2). ➢ The F_1 phenotype differs from both the parental phenotype. ➢ The F_1 generation produces an intermediate colour pink (R^1R^2). ➢ Here one allele is not completely dominant to another allele. Such allelic interaction is known as incomplete dominance. ➢ The pink coloured plants of F_1 generation were interbred. ➢ In F_2 both phenotypic and genotypic ratios were found to be identical as 1 : 2 : 1. ➢ R^1 allele codes for an enzyme responsible for the formation of red pigment. ➢ R^2 allele codes for an enzyme responsible for the formation of white pigment. ➢ R^1 and R2 genotypes produce only enough red pigments to make the flower pink. ➢ In F_2 both phenotypic and genotypic ratios are 1 : 2 : 1.	1 4
36.	**Alternative Splicing in plants** ➢ Alternative splicing is an important mechanism / process by which multiple mRNA's and multiple proteins products can be generated from a single gene. **Significance of alternative splicing** ➢ The proteins transcribed from alternatively spliced mRNA containing different amino acid sequence lead to the generation of protein diversity and biological functions. ➢ Multiple protein isoforms are formed. ➢ It creates multiple mRNA transcripts from a single gene. A process of producing related proteins from a single gene thereby the number of gene products are increased. ➢ It plays an important role in plant functions such as stress response and trait selection. The plant adapts or regulates itself to the changing environment.	2 3
36. **(OR)**	**Kinds of Linkage** ➢ T.H. Morgan found two types of linkage. They are complete linkage and incomplete linkage. **Complete Linkage** ➢ If the chances of separation of two linked genes are not possible those genes always remain together as a result, only parental combinations are observed. ➢ The linked genes are located very close together on the same chromosome such genes do not exhibit crossing over. This phenomenon is called complete linkage. ➢ It is rare but has been reported in male Drosophila. **Incomplete Linkage** ➢ If two linked genes are sufficiently a part, the chances of their separation are possible. As a result, parental and non-parental combinations are observed. ➢ The linked genes exhibit some crossing over. This phenomenon is called incomplete linkage. This was observed in maize.	2½ 2½
37.	**Dicot seed** ➢ The mature seeds are attached to the fruit wall by a stalk called funiculus. ➢ The funiculus disappears leaving a scar called hilum. Below the hilum a small pore called micropyle is present. It facilitates entry of oxygen and water into the seeds during germination. ➢ Each seed has a thick outer covering called seed coat. The seed coat is developed from integuments of the ovule. The outer coat is called testa and is hard whereas the inner coat is thin, membranous and is called tegmen. ➢ In Pea plant the tegmen and testa are fused. Two cotyledons laterally attached to the embryonic axis and store the food materials in pea whereas in other seeds like castor the endosperm contains reserve food and thecotyledons are thin. The portion of embryonal axis projecting beyond the cotyledons is called radicle or embryonic root. ➢ The other end of the axis called embryonic shoot is the plumule. Embryonal axis above the level of cotyledon is called epicotyl whereas the cylindrical region between the level of cotyledon is called hypocotyl	3

		2
37. **(OR)**	**Structure of mature Anther** ➢ The mature anther wall consists of the following layers ▪ Epidermis ▪ Endothecium ▪ Middle layers ▪ Tapetum. **Epidermis** ➢ It is single layered and protective in function. ➢ The cells undergo repeated anticlinal divisions to cope up with the rapidly enlarging internal tissues. **Endothecium:** ➢ It is found below the epidermis ➢ The inner tangential wall develops bands of cellulose. ➢ The hygroscopic nature of endothecium helps in the dehiscence of anther at maturity. **Middle layers** ➢ Two to three layers of cells next to endothecium constitute middle layers. ➢ They are generally ephemeral. They disintegrate or get crushed during maturity. **Tapetum:** ➢ It is the innermost layer of anther wall. ➢ It is derived partly from the peripheral wall layer and partly from the connective tissue of the anther lining the anther locule. Thus, the tapetum is dual in origin ➢ It attains maximum development at the tetrad stage of microsporogenesis. 	3 **Diagram - 2**
38.	**Molecular characterization of Mendel's gene for plant height** ➢ The plant height is controlled by a single gene with two alleles. ➢ (i) The cells of the pea plant have the ability to convert a precursor molecule of gibberellins into an active form (GA1) ➢ (ii) Tall pea plants have one allele (Le) that codes for a protein (functional enzyme) which functions normally in the gibberellin-synthesis pathway and catalyzes the formation of gibberellins (GA1). ➢ The allele is dominant even if it is two (Le Le) or single (Le le), it produces gibberellins and the pea plants are tall. ➢ Dwarf pea plants have two recessive alleles (le le) which code for non-functional protein, hence they are dwarf.	3



2

38. **(OR)**

Nicotiana exhibit self - incompatibility

- In plants, multiple alleles have been reported in association with self-sterility or self incompatibility.
- Self-sterility means that the pollen from a plant is unable to germinate on its own stigma. This will not be able to bring about fertilization in the ovules of the same plant.
- East (1925) observed multiple alleles in Nicotiana which are responsible for self-sterility.
- The gene for self-incompatibility can be designated as S, which has allelic series S_1, S_2, S_3, S_4 and S_5.
- The cross-fertilizing tobacco plants were not always homozygous as S_1S_1 or S_2S_2, but all plants were heterozygous as S_1S_2, S_3S_4, S_5S_6.
- When crosses were made between different S_1S_2 plants, the pollen tube did not develop normally.
- But effective pollen tube development was observed when crossing was made with other than S_1S_2 for example S_3S_4.
- When crosses were made between seed parents with S_1S_2 and pollen parents with S_2S_3, two kinds of pollen tubes were distinguished.
- Pollen grains carrying S_2 were not effective, but the pollen grains carrying S_3 were capable of fertilization.

3

Female parent (Stigma spot)	**Male parent (Pollen source)**		
	S_1S_2	**S_2S_3**	**S_3S_4**
S_1S_2	Self sterile	S_3S_2 S_3S_1	S_3S_1 S_3S_2 S_4S_1 S_4S_2
S_2S_3	S_1S_2 S_1S_3	Self sterile	S_4S_2 S_4S_3
S_3S_4	S_1S_3 S_1S_4 S_2S_3 S_2S_4	S_2S_3 S_2S_4	Self sterile

2