

Unit-VI: Reproduction in Plants

Chapter-1. Asexual and Sexual Reproduction in Plants

Book back Answers

I. One mark questions:-

- Choose the correct statement from the following
 - Gametes are involved in asexual reproduction
 - Bacteria reproduce asexually by budding
 - Conidia formation is a method of sexual reproduction
 - Yeast reproduce by budding
- An eminent Indian embryologist is
 - S.R.Kashyap
 - P.Maheswari
 - M.S. Swaminathan
 - K.C.Mehta
- Identify the correctly matched pair
 - Tuber - *Allium cepa*
 - Sucker – *Pistia*
 - Rhizome - *Musa*
 - Stolon - *Zingiber*
- Pollen tube was discovered by
 - J.G.Kolreuter
 - G.B.Amici
 - E.Strasburger
 - E.Hanning
- Size of pollen grain in *Myosotis*
 - 10 micrometer
 - 20 micrometer
 - 200 micrometer
 - 2000 micrometer
- First cell of male gametophyte in angiosperm is
 - Microspore
 - megaspore
 - Nucleus
 - Primary Endosperm Nucleus
- Match the following

I) External fertilization	i) pollen grain	a) I-iv; II-i; III-ii; IV-iii
II) Androecium	ii) anther wall	b) I-iii; II-iv; III-i; IV-ii
III) Male gametophyte	iii) algae	c) I-iii; II-iv; III-ii; IV-i
IV) Primary parietal layer	iv) stamens	d) I-iii; II-i; III-iv; IV-ii
- Arrange the layers of anther wall from locus to periphery
 - Epidermis, middle layers, tapetum, endothecium
 - Tapetum, middle layers, epidermis, endothecium
 - Endothecium, epidermis, middle layers, tapetum
 - Tapetum, middle layers endothecium epidermis
- Identify the incorrect pair
 - sporopollenin - exine of pollen grain
 - tapetum – nutritive tissue for developing microspores
 - Nucellus – nutritive tissue for developing embryo
 - obturator – directs the pollen tube into micropyle
- Assertion : Sporopollenin preserves pollen in fossil deposits
Reason : Sporopollenin is resistant to physical and biological decomposition
 - assertion is true; reason is false
 - assertion is false; reason is true
 - Both Assertion and reason are not true
 - Both Assertion and reason are true.
- Choose the correct statement(s) about tenuinucellate ovule
 - Sporogenous cell is hypodermal
 - Ovules have fairly large nucellus
 - sporogenous cell is epidermal
 - ovules have single layer of nucellus tissue
- Which of the following represent megagametophyte
 - Ovule
 - Embryo sac
 - Nucellus
 - Endosperm
- In *Haplopappus gracilis*, number of chromosomes in cells of nucellus is 4. What will be the chromosome Number in Primary endosperm cell?
 - 8
 - 12
 - 6
 - 2
- Transmitting tissue is found in
 - Micropylar region of ovule
 - Pollen tube wall
 - Stylar region of gynoecium
 - Integument
- The scar left by funiculus in the seed is
 - tegmen
 - radicle
 - epicotyl
 - hilum
- A Plant called X possesses small flower with reduced perianth and versatile anther. The probable agent for pollination would be
 - water
 - air
 - butterflies
 - beetles
- Consider the following statement(s)
 - In Protandrous flowers pistil matures earlier
 - In Protogynous flowers pistil matures earlier
 - Herkogamy is noticed in unisexual flowers
 - Distyly is present in *Primula*
 - i and ii are correct
 - ii and iv are correct
 - ii and iii are correct
 - i and iv are correct

18. Coelorrhiza is found in
 a)Paddy b)Bean c)Pea d)Tridax
19. Parthenocarpic fruits lack
 a)Endocarp b)Epicarp c)Mesocarp d) seed
20. In majority of plants pollen is liberated at
 a) 1 celled stage b) 2 celled stage c) 3 celled stage d) 4 celled stage

II.Two, Three, Five Mark Questions:-

21. What is reproduction?

Reproduction is a vital process for the existence of a species and it also brings suitable changes through Variation in the off springs for their survival on earth.

22. List out two sub-aerial stem modifications with example.

- (i) Rhizome - *Musa paradisiaca* (ii) Tuber - *Solanum tuberosum*

23. What is layering?

- (i) The stem of a parent plant is allowed to develop roots while still intact.
 (ii) When the root develops, the rooted part is cut and planted to grow as a new plant.
 (iii) Examples: *Ixora* and *Jasminum*.

24. What are clones?

- (i) The morphologically and genetically identical individuals are called as clones.
 (ii) Which are produced by Asexual Reproduction.

25. A detached leaf of *Bryophyllum* produces new plants. How?

- (i) In some plants adventitious buds are developed on their leaves.
 (ii) When they are detached from the parent plant they grow into new individual plants.
 (iii) Examples: *Bryophyllum*,

26. Differentiate Grafting and Layering.

S.No.	Grafting	Layering
1.	In this method parts of two different plants are joined so that they continue to grow as one plant.	In this method the stem of a parent plant is allowed to develop roots while still intact.
2.	The plant which is in contact with the soil is called stock and the plant used for grafting is called scion .	When the root develops, the rooted part is cut and planted to grow as a new plant.
3.	Example: <i>Citrus</i> , <i>Mango</i> and <i>Apple</i> .	Examples: <i>Ixora</i> and <i>Jasminum</i> .

27. "Tissue culture is the best method for propagating rare and endangered plant species"- Discuss.

- (i) The regeneration of a whole plant from single cell or tissue by the tissue culture technique is called Micropropagation.
 (ii) Rare and endangered plants can be propagated through micropropagation. So tissue culture is the best method for propagating rare and endangered plant species.

28. Distinguish mound layering and air layering.

S.No.	Mound layering	Air layering.
1.	This method is applied for the plants having flexible branches.	In this method the stem is girdled at nodal region and hormones are applied to this region which promotes rooting.
2.	The lower branch with leaves is bent to the ground and part of the stem is buried in the soil and tip of the branch is exposed above the soil.	This portion is covered with damp or moist soil using a polythene sheet. Roots emerge in these branches after 2-4 months.
3.	After the roots emerge from the part of the stem buried in the soil, a cut is made in parent plant so that the buried part grow into a new plant.	Such branches are removed from the parent plant and grown in a separate pot or ground.

29. Explain the conventional methods adopted in vegetative propagation of higher plants.

The common methods of conventional propagation are cutting, grafting and layering.

(i) Cutting:

- 1.It is the method of producing a new plant by cutting the plant parts such as root, stem and leaf from the parent plant.
- 2.The cut part is placed in a suitable medium for growth. It produces root and grows into a new plant.
- 3.Examples: stem cutting - *Hibiscus*, leaf cutting - *Bryophyllum*.

(ii) Grafting:

- 1.In this method parts of two different plants are joined so that they continue to grow as one plant.
- 2.The plant which is in contact with the soil is called **stock** and the plant used for grafting is called **scion**.
- 3.Examples: Citrus, Mango and Apple.
- 4.Types of grafting: Bud grafting, tongue grafting, crown grafting, wedge grafting and approach grafting.

(iii) layering:

- 1.The stem of a parent plant is allowed to develop roots while still intact.
- 2.When the root develops, the rooted part is cut and planted to grow as a new plant.
- 3.Examples: *Ixora* and *Jasminum*.
- 4.Types of Layering: Mount layering and Air layering.

30. What is Cantharophily.

Pollination takes place by beetle is called Cantharophily.

31. List any two strategy adopted by bisexual flowers to prevent self-pollination.

The following strategies are adopted by bisexual flowers to prevent self-pollination

- 1.Dichogamy – (i) Protandry (ii) Protogyny
- 2.Herkogamy
- 3.Heterostyly
- 4.Self sterility

32. What is endothelium.

The inner layer of the integument may become specialized to perform the nutritive function for the embryo sac and is called as endothelium or integumentary tapetum. Example : Asteraceae

33. “The endosperm of angiosperm is different from gymnosperm”. Do you agree. Justify your answer.

- 1.Yes I agree, Endosperm of angiosperm is different from gymnosperm because, Angiosperm plant endosperms are formed during fertilization but in gymnosperm plant endosperms are formed before fertilization.
- 2.So, angiosperm plant endosperms are triploid (3n) and gymnosperm plant endosperms are haploid (1n) condition.

34. Define the term Diplospory or Generative apospory.

- 1.A diploid embryo sac is formed from megaspore mother cell without a regular meiotic division is called diplospory.
- 2.Examples. *Eupatorium* and *Aerva*.

35. What is polyembryony. How it can commercially exploited.

- 1.Occurrence of more than one embryo in a seed is called polyembryony.
- 2.The seedlings formed from the nucellar tissue in *Citrus* are found better clones for Orchards.
- 3.Embryos derived through polyembryony are found virus free.

36. Why does the zygote divides only after the division of Primary endosperm cell.

- 1.The primary endosperm nucleus (PEN) divides immediately after fertilization but before the zygote starts to divide, into an endosperm.
- 2.The primary endosperm nucleus is the result of triple fusion (two polar nuclei and one sperm nucleus) and thus has 3n number of chromosomes.
- 3.It is a nutritive tissue and regulatory structure that nourishes the developing embryo.

37. What is Mellitophily?

Pollination takes place by bees is called mellitophily.

38. “Endothecium is associated with dehiscence of anther” Justify the statement.

- 1.It is generally a single layer of radially elongated cells found below the epidermis.
- 2.The cells along the junction of the two sporangia of an anther lobe lack these thickenings. This region is called stomium.
- 3.This region along with the hygroscopic nature of endothecium helps in the dehiscence of anther at maturity.

39. List out the functions of tapetum.

- 1.It supplies nutrition to the developing microspores.
- 2.It contributes sporopollenin through ubisch bodies thus plays an important role in pollen wall formation.
- 3.Exine proteins responsible for 'rejection reaction' of the stigma are present in the cavities of the exine.
These proteins are derived from tapetal cells.

40. Write short note on Pollen kitt.

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

41. Distinguish tenuinucellate and crassinucellate ovules.

Tenuinucellate ovule	Crassinucellate ovule
1.If the sporogenous cell is hypodermal with a single layer of nucellar tissue around it is called tenuinucellate ovule.	Ovules with subhypodermal sporogenous cell is called crassinucellate ovule.
2.Normally tenuinucellate ovules have very small nucellus.	Normally these ovules have fairly large nucellus.

42. 'Pollination in Gymnosperms is different from Angiosperms' – Give reasons.

Gymnosperms	Angiosperms
1.Pollination in gymnosperms is direct method.	Pollination in angiosperms is indirect method.
2.pollens are deposited directly on the exposed ovules.	pollens are deposited on the stigma of the pistil.

43. Write short note on Heterostyly.

- 1.Some plants produce two or three different types of flowers that are different in their length of stamens and style.
- 2.Pollination will take place only between organs of the same length.

44. Enumerate the characteristic features of Entomophilous flowers.

- 1.Generally flowers are large in size.
- 2.Flowers are brightly coloured.
- 3.Flowers are scented and produce nectar.
- 4.Flowers pollinated by flies and beetles produce foul odour to attract pollinators.
- 5.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.

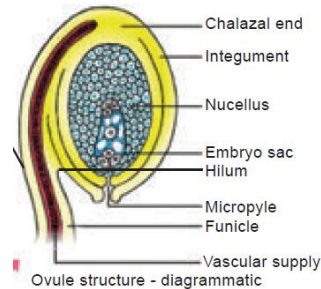
45. Discuss the steps involved in Microsporogenesis.

- 1.formation of haploid(1n) microspores from diploid(2n) microspore mother cell through meiosis is called Microsporogenesis.
- 2.The primary sporogeneous cells directly, or may undergo a few mitotic divisions to form sporogenous tissue.
- 3.The last generation of sporogenous tissue functions as microspore mother cells.
- 4.Each microspore mother cell divides meiotically to form a tetrad of four haploid microspores (microspore tetrad).
- 5.In some plants, all the microspores in a microsporangium remain held together called pollinium.
Example: *Calotropis*.
- 6.Pollinia are attached to a clamp or clip like sticky structure called corpusculum.
- 7.The filamentous or thread like part arising from each pollinium is called retinaculum.
- 8.The whole structure looks like inverted letter 'Y' and is called translator.

46. With a suitable diagram explain the structure of ovule or Megasporangium.

- 1.Ovule is also called megasporangium. It is protected by one or two covering called integuments.
- 2.A mature ovule consists of a stalk which is called as funiculus (also called funicle) is present at the base and it attaches the ovule to the placenta.
- 3.The point of attachment of funicle to the body of the ovule is known as hilum.
- 4.In an inverted ovule, the funicle is adnate to the body of the ovule forming a ridge called raphe.
- 5.The body of the ovule is made up of a central mass of parenchymatous tissue called nucellus which has large reserve food materials.
- 6.The nucellus is enveloped by one or two protective coverings called integuments.
- 7.Integument encloses the nucellus completely except at the top where it is free and forms a pore called micropyle.

8. The ovule with one or two integuments are said to be unitegmic or bitegmic ovules.
9. The integument and the funicle meet or merge is called as chalaza.
10. There is a large sac-like structure in the nucellus toward the micropylar end called embryo sac or female gametophyte.
11. In some species the inner layer of the integument may become specialized to perform the nutritive function for the embryo sac and is called as endothelium or integumentary tapetum. Example: Asteraceae.

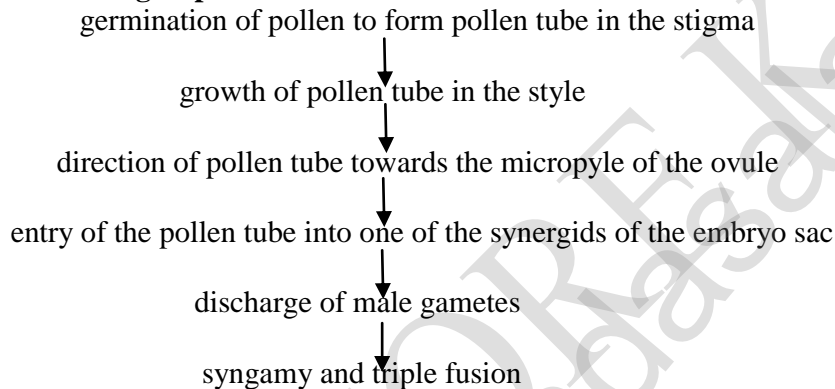


47. Give a concise account on steps involved in fertilization of an angiosperm plant.

(i) Fertilization:

1. The fusion of male and female gamete is called fertilization.
2. Fertilization in angiosperms is double fertilization type.

(ii) The following steps are involved in fertilization:-



(iii) pollen- pistil interaction:-

The events from pollen deposition on the stigma to the entry of pollen tube in to the ovule is called Pollen- pistil interaction.

48. What is endosperm. Explain the types.

(i) Endosperm:-

1. The primary endosperm nucleus (PEN) divides immediately after fertilization but before the zygote starts to divide, into an endosperm.
2. Depending upon the mode of development three types of endosperm are recognized in angiosperms.

(ii) Types of Endosperm:-

1. Nuclear endosperm
2. Cellular endosperm
3. Helobial endosperm

1. Nuclear endosperm:-

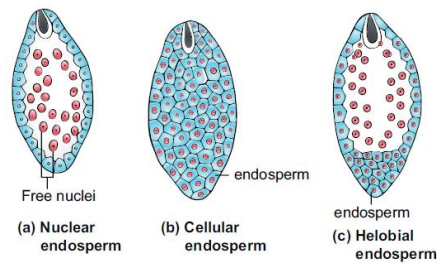
- (i) Primary Endosperm Nucleus undergoes several mitotic divisions without cell wall formation thus a free Nuclear condition exists in the endosperm.
- (ii) Examples: *Coccinia*, *Capsella* and *Arachis*.

2. Cellular endosperm:-

- (i) Primary endosperm nucleus divides into 2 nuclei and it is immediately followed by wall formation.
- (ii) Subsequent divisions also follow cell wall formation.
- (iii) Examples: *Adoxa*, *Helianthus* and *Scoparia*.

3. Helobial endosperm:-

- (i) Primary Endosperm Nucleus moves towards base of embryo sac and divides into two nuclei.
- (ii) Cell wall formation takes place leading to the formation of a large micropylar and small chalazal chamber.
- (iii) Examples : *Hydrilla* and *Vallisneria*.



49. Differentiate the structure of Dicot and Monocot seed.

Dicot seed	Monocot seed
1. Two Cotyledons	One Cotyledon (Scutellum)
2. Reserve food Material stored in Cotyledons	Reserve food Material Stored in Endosperm
3. Plumule is present	Coleoptile is present
4. Radicle is present	Coleorhiza is present
5. Funiculus is present	Absent
6. Hilum is present	Absent
7. Micropyle is present	Absent
8. Testa is present	Absent
9. Tegmen is present	Absent
10. Eg: <i>Cicer arietinum</i> (chick pea)	Eg: <i>Oryza sativa</i> (Paddy)

50. Give a detailed account on parthenocarpy. Add a note on its significance.

Parthenocarpy:-

- (i) The development of fruit without fertilization is called Parthenocarpy.
- (ii) Examples: Banana, Grapes and Papaya.

Types of Parthenocarpy:-

Nitsch in 1963 classified the parthenocarpy into following three different types.

1. Genetic Parthenocarpy
2. Environmental Parthenocarpy
3. Chemically induced Parthenocarpy

1. Genetic Parthenocarpy:

- (i) Parthenocarpy arises due to hybridization or mutation.
- (ii) Examples: *Citrus*, *Cucurbita*.

2. Environmental Parthenocarpy:

- (i) Parthenocarpy arises due to environmental conditions like frost, fog, low temperature, high temperature etc.,
- (ii) Example: low temperature for 3-19 hours induces parthenocarpy in Pear.

3. Chemically induced Parthenocarpy:

- (i) Application of growth promoting substances like Auxins and Gibberellins induces parthenocarpy.

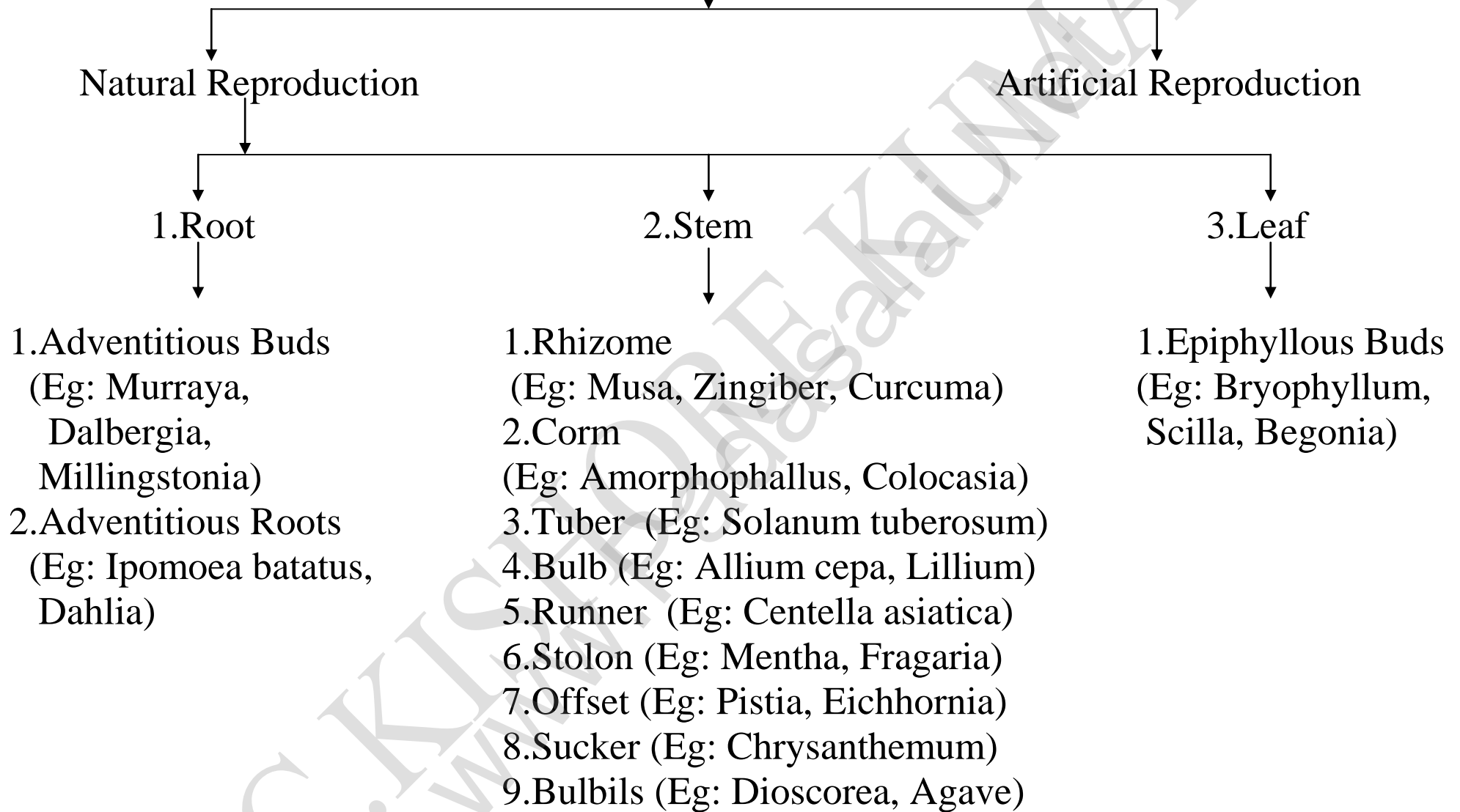
Significance of Parthenocarpy:

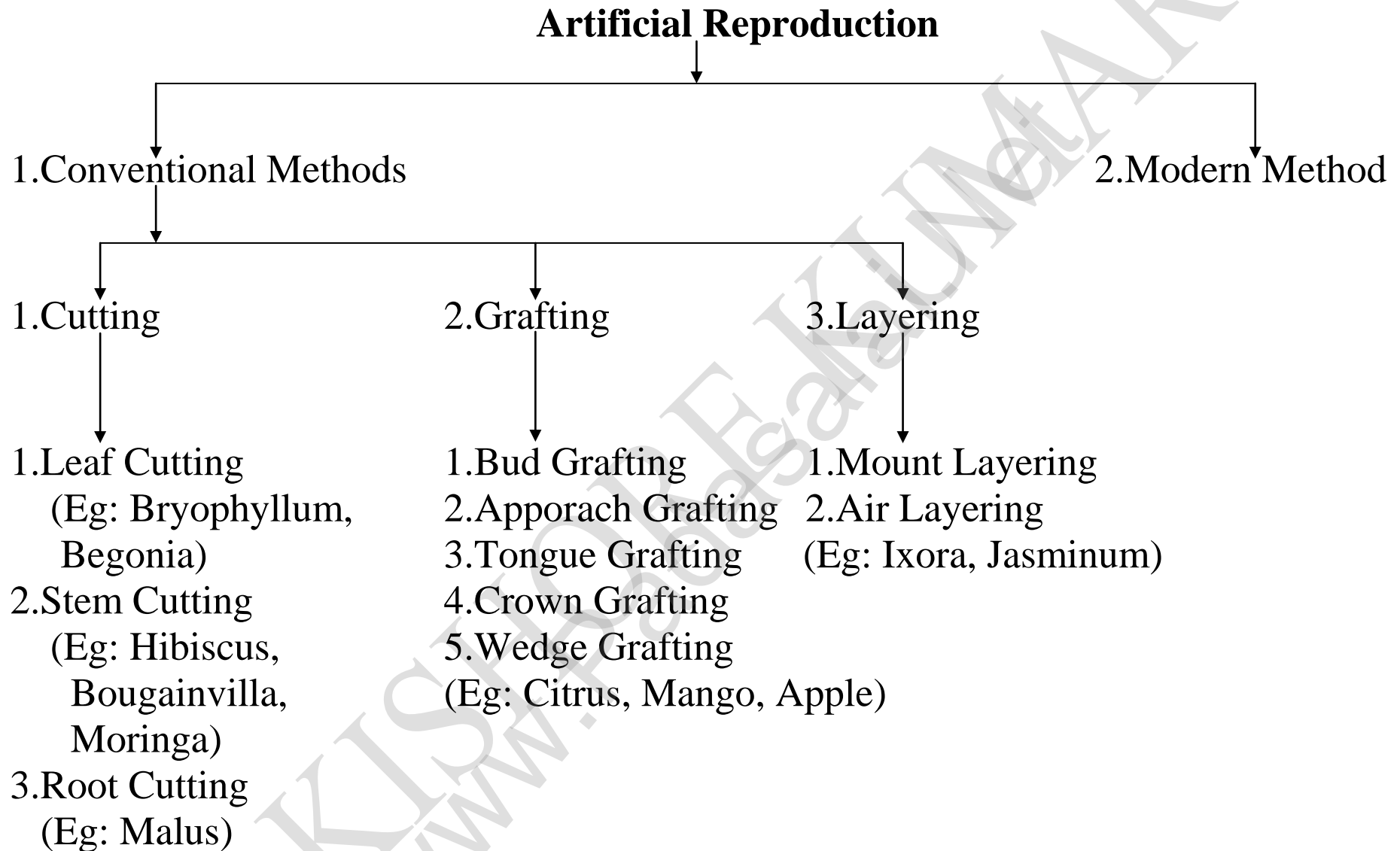
- (i) The seedless fruits have great significance in horticulture.
- (ii) The seedless fruits have great commercial importance.
- (iii) Seedless fruits are useful for the preparation of jams, jellies, sauces, fruit drinks etc.
- (iv) High proportion of edible part is available in parthenocarpic fruits due to the absence of seeds.

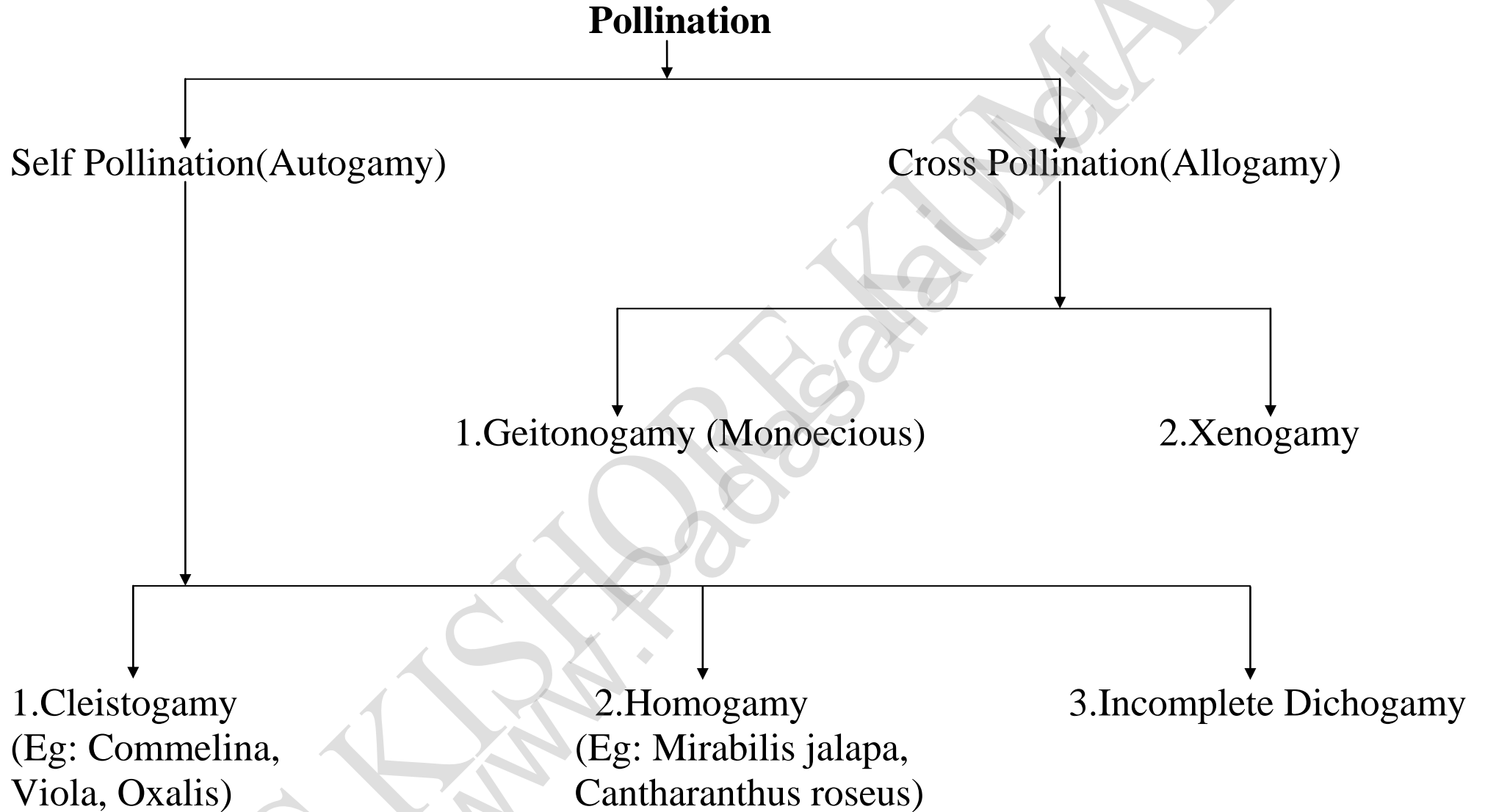
I.One mark Answers:-

1. d) Yeast reproduce by budding
2. b) P.Maheswari
3. c) Rhizome - *Musa*
4. b) G.B.Amici
5. a) 10 micrometer
6. a) Microspore
7. b) I-iii; II-iv; III-i; IV-ii
8. d) Tapetum, middle layers endothecium epidermis
9. c) Nucellus – nutritive tissue for developing embryo
10. d) Both Assertion and reason are true.
11. a) Sporogenous cell is hypodermal
12. b) Embryo sac
13. c) 6
14. c) Styler region of gynoecium
15. d) hilum
16. b) air
17. b) ii and iv are correct
18. a) Paddy
19. d) seed
20. b) 2 celled stage

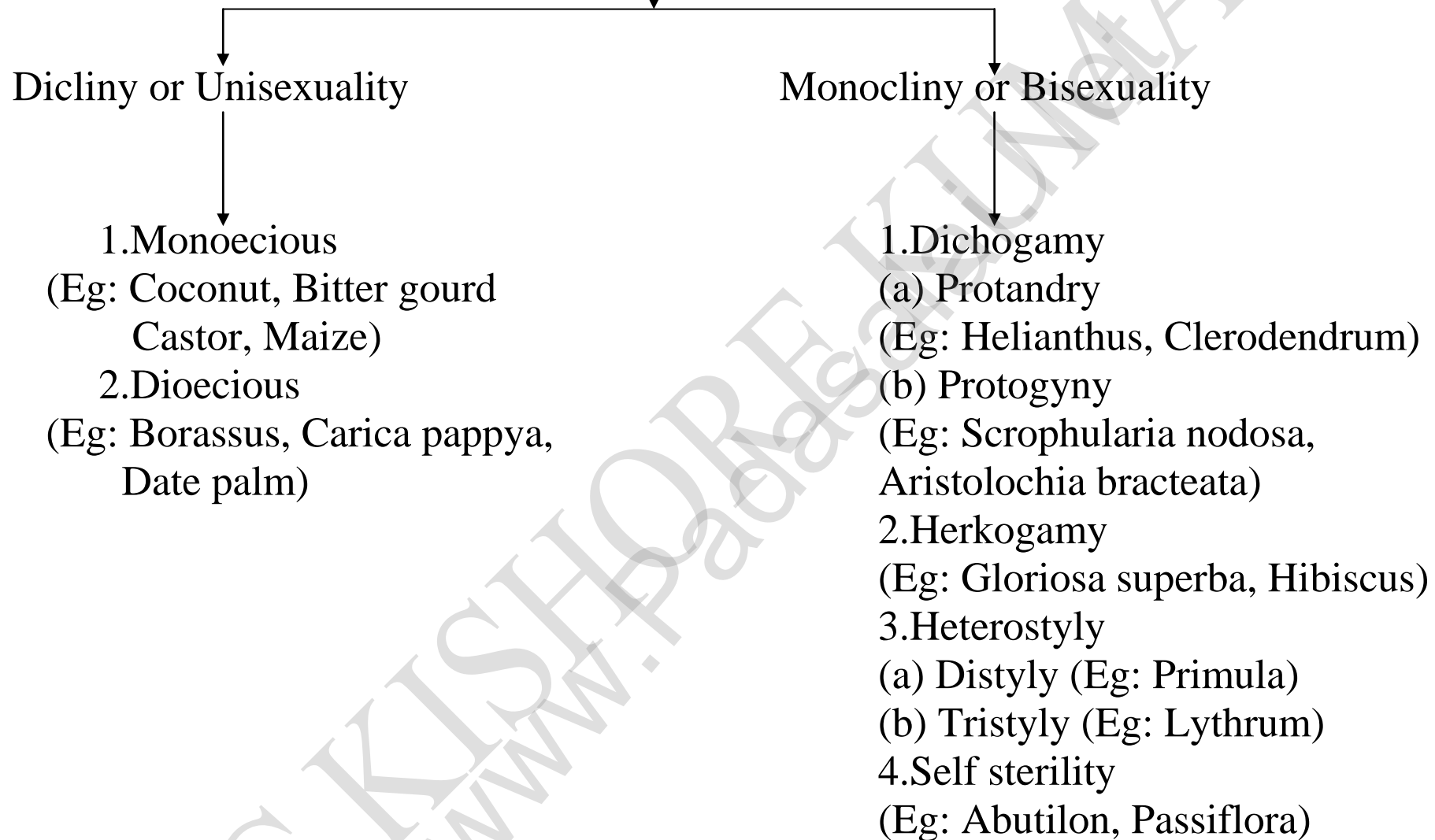
Vegetative Reproduction



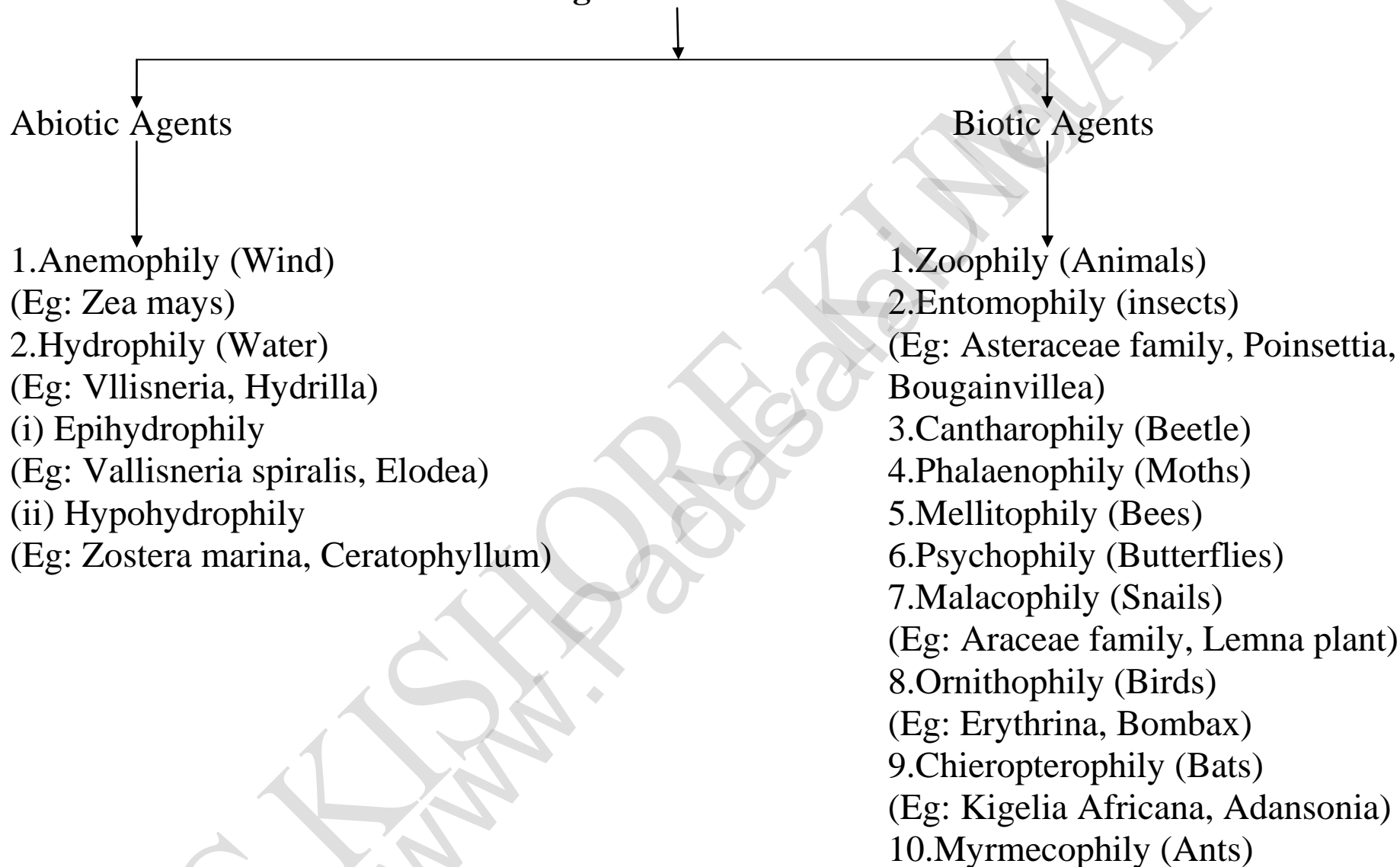




Contrivances of Cross Pollination (or) Out Breed Devices



Agents of Pollination



Unit-VII: Genetics

Chapter-2. Classical Genetics

Book back Answers

I. One mark questions:-

1. Extra nuclear inheritance is a consequence of presence of genes in
 - a) Mitochondria and chloroplasts
 - b) Endoplasmic reticulum and mitochondria
 - c) Ribosomes and chloroplast
 - d) Lysosomes and ribosomes
2. In order to find out the different types of gametes produced by a pea plant having the genotype AaBb, it should be crossed to a plant with the genotype
 - a) aaBB
 - b) AaBB
 - c) AaBb
 - d) aabb
3. How many different kinds of gametes will be produced by a plant having the genotype AABbCC?
 - a) Three
 - b) Four
 - c) Nine
 - d) Two
4. Which one of the following is an example of polygenic inheritance?
 - a) Flower colour in *Mirabilis Jalapa*
 - b) Production of male honey bee
 - c) Pod shape in garden pea
 - d) Skin Colour in humans
5. In Mendel's experiments with garden pea, round seed shape (RR) was dominant over wrinkled seeds (rr), yellow cotyledon (YY) was dominant over green cotyledon (yy). What are the expected phenotypes in the F₂ generation of the cross RRYy x rryy?
 - a) Only round seeds with green cotyledons
 - b) Only wrinkled seeds with yellow cotyledons
 - c) Only wrinkled seeds with green cotyledons
 - d) Round seeds with yellow cotyledons and wrinkled seeds with yellow cotyledons
6. Test cross involves
 - a) Crossing between two genotypes with recessive trait
 - b) Crossing between two F₁ hybrids
 - c) Crossing the F₁ hybrid with a double recessive genotype
 - d) Crossing between two genotypes with dominant trait
7. In pea plants, yellow seeds are dominant to green. If a heterozygous yellow seed plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in F₁ generation?
 - a) 9:1
 - b) 1:3
 - c) 3:1
 - d) 50:50
8. The genotype of a plant showing the dominant phenotype can be determined by
 - a) Back cross
 - b) Test cross
 - c) Dihybrid cross
 - d) Pedigree analysis
9. Select the correct statement from the ones given below with respect to dihybrid cross
 - a) Tightly linked genes on the same chromosomes show very few combinations
 - b) Tightly linked genes on the same chromosomes show higher combinations
 - c) Genes far apart on the same chromosomes show very few recombinations
 - d) Genes loosely linked on the same chromosomes show similar recombinations as the tightly linked ones
10. Which Mendelian idea is depicted by a cross in which the F₁ generation resembles both the parents
 - a) Incomplete dominance
 - b) Law of dominance
 - c) Inheritance of one gene
 - d) Co-dominance
11. Fruit colour in squash is an example of
 - a) Recessive epistasis
 - b) Dominant epistasis
 - c) Complementary genes
 - d) Inhibitory genes
12. In his classic experiments on Pea plants, Mendel did not use
 - a) Flowering position
 - b) Seed colour
 - c) Pod length
 - d) Seed shape
13. The epistatic effect, in which the dihybrid cross 9:3:3:1 between AaBb Aabb is modified as
 - a) Dominance of one allele on another allele of both loci
 - b) Interaction between two alleles of different loci
 - c) Dominance of one allele to another alleles of same loci
 - d) Interaction between two alleles of some loci
14. In a test cross involving F₁ dihybrid flies, more parental type offspring were produced than the recombination type offspring. This indicates
 - a) The two genes are located on two different chromosomes
 - b) Chromosomes failed to separate during meiosis
 - c) The two genes are linked and present on the same chromosome
 - d) Both of the characters are controlled by more than one gene

15. The genes controlling the seven pea characters studied by Mendel are known to be located on how many different chromosomes?
a) Seven b) Six c) Five d) Four
16. Which of the following explains how progeny can possess the combinations of traits that none of the parent possessed?
a) Law of segregation b) Chromosome theory c) Law of independent assortment d) Polygenic inheritance
17. "Gametes are never hybrid". This is a statement of
a) Law of dominance b) Law of independent assortment c) Law of segregation d) Law of random fertilization
18. Gene which suppresses other genes activity but does not lie on the same locus is called as
a) Epistatic b) Supplement only c) Hypostatic d) Codominant
19. Pure tall plants are crossed with pure dwarf plants. In the F_1 generation, all plants were tall. These tall plants of F_1 generation were selfed and the ratio of tall to dwarf plants obtained was 3:1. This is called
a) Dominance b) Inheritance c) Codominance d) Heredity
20. The dominant epistasis ratio is
a) 9:3:3:1 b) 12:3:1 c) 9:3:4 d) 9:6:1
21. Select the period for Mendel's hybridization experiments
a) 1856 - 1863 b) 1850 - 1870 c) 1857 - 1869 d) 1870 - 1877
22. Among the following characters which one was not considered by Mendel in his experimentation pea?
a) Stem – Tall or dwarf b) Trichomal glandular or non-glandular
c) Seed – Green or yellow d) Pod – Inflated or constricted

II. Two, Three, Five Mark Questions:-

23. Name the seven contrasting traits of Mendel.

Character	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

24. What is meant by true breeding or pure breeding lines / strain?

The phenomenon of continuous self pollination and traits inheritance from parent to offspring is called true breeding or pure breeding lines.

25. Give the names of the scientists who rediscovered Mendelism.

1. Hugo de Vries (Holland), 2. Carl Correns (Germany), 3. Tschermak (Austria).

26. What is back cross?

- (i) F_1 hybrid crossed with any one of the parental genome is called back cross.
(ii) Back cross are two types. 1. Dominant back cross 2. Recessive back cross.

27. Define Genetics.

Genetics is the branch of biology which deals with the mechanism of transmission of characters from parents to offsprings.

28. What are multiple alleles?

Multiple alleles are a set of three or more genes controlling the same character located on the homologous chromosomes.

29. What are the reasons for Mendel's successes in his breeding experiment?

1. He applied mathematics and statistical methods in Biology.
2. His experiments were carefully planned.
3. He used large samples.

30. Explain the law of dominance in monohybrid cross.

1. In a dissimilar pair of factors, one is dominant and other one is recessive.
2. This law explained in Mendel's monohybrid cross.

Parental generation: Tall X Dwarf
(TT) (tt)

Gametes: (T) (t)

F1 Generation: Heterozygous Tall
(Tt)

F2 Generation: Tt X Tt

	T	t
T	TT (Homozygous tall)	Tt (Heterozygous tall)
t	Tt (Heterozygous tall)	tt (Homozygous dwarf)

Phenotypic Ratio: 3 (Tall): 1 (Dwarf)

Genotypic Ratio: 1(Homozygous tall): 2(Heterozygous tall): 1(Homozygous dwarf)

31. Differentiate incomplete dominance and codominance.

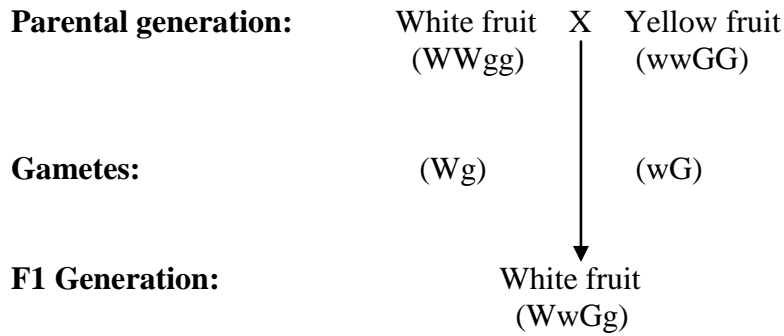
Incomplete dominance	codominance
1. One allele is not completely dominant to another allele it shows incomplete dominance.	Two alleles are expressed in the heterozygous individual is known as codominance.
2. Example: 4'O clock plant (Mirabilis jalapa)	Example: Camellia.

32. What is meant by cytoplasmic inheritance?

Cytoplasmic organelles such as chloroplast and Mitochondria act as inheritance vectors, It is called as Cytoplasmic inheritance.

33. Describe dominant epistasis with an example.

1. The prevention of the expression of one gene by another non-allelic gene is called Epistasis.
2. The inhibiting gene is called epistatic gene. The inhibited gene is called hypostatic gene.
3. Epistasis is of two types namely, dominant epistasis and recessive epistasis.
4. The prevention of the expression of a gene by a dominant non-allelic gene is called dominant epistasis.
5. The prevention of the expression of a gene by a recessive non-allelic gene is called recessive epistasis.
6. Summer squash white fruit plant (WWgg) is crossed with yellow fruit plant (wwGG). It will produce heterozygous (WwGg) white fruit in F1 generation.
7. When F1 generation heterozygous plants are self crossed, It will produce the phenotypic ratio of 12 white, 3 yellow, and 1 green in F2 generation.
8. So, the dominant allele "W" is suppress or mask the character of other non-allelic genes.



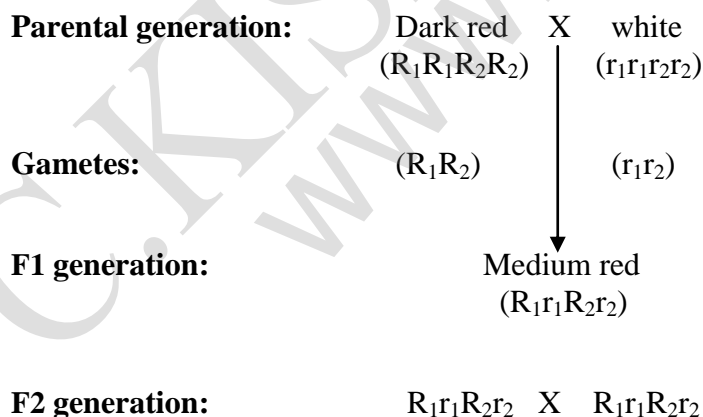
F2 Generation: WwGg X WwGg

	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)

Phenotypic Ratio: 12(White): 3(Yellow): 1(Green)

34. Explain polygenic inheritance with an example.

1. A group of genes that together determine the character of an organism is called polygenic inheritance.
2. The first polygenic inheritance experiment was demonstrated by H. Nilson-Ehle (1909) wheat kernels.
3. Kernel colour is controlled by two genes with two alleles.
4. Red kernel colour was dominant to white kernel.
5. Dark red kernel plant ($R_1R_1R_2R_2$) is crossed with white kernel plant ($r_1r_1r_2r_2$). It will produce heterozygous ($R_1r_1R_2r_2$) medium red plant in F1 generation.
6. When F1 generation heterozygous plants are self crossed, It will produce the phenotypic ration of 15 red kernel, and 1 white kernel in F2 generation.



	R_1R_2	R_1r_2	r_1R_2	r_1r_2
R_1R_2	$R_1R_1R_2R_2$ (Dark red)	$R_1R_1R_2r_2$ (Medium-dark red)	$R_1r_1R_2R_2$ (Medium-dark red)	$R_1r_1R_2r_2$ (Medium red)
R_1r_2	$R_1R_1R_2r_2$ (Medium-dark red)	$R_1R_1r_2r_2$ (Medium red)	$R_1r_1R_2r_2$ (Medium red)	$R_1r_1r_2r_2$ (Light red)
r_1R_2	$R_1r_1R_2R_2$ (Medium-dark red)	$R_1r_1R_2r_2$ (Medium red)	$r_1r_1R_2R_2$ (Medium red)	$r_1r_1R_2r_2$ (Light red)
r_1r_2	$R_1r_1R_2r_2$ (Medium red)	$R_1r_1r_2r_2$ (Light red)	$r_1r_1R_2r_2$ (Light red)	$r_1r_1r_2r_2$ (White)

Phenotypic Ratio: 15(Red):1(White)

35. Differentiate continuous variation with discontinuous variation.

Discontinuous variation	Continuous variation
1.This is limited variations.	This variations are based on environmental and genetic factors.
2.Characteristics are controlled by one or two major genes.	It is a continous change without any break.
3.It is genetically determined by inheritance factors.	It is determined by many genes.
4.It is unaffected by environmental conditions.	It is affected by environmental conditions.
5.Example: Style length in Primula	Example: Human height and skin color.

36. Explain with an example how single genes affect multiple traits and alleles the phenotype of an organism.

- 1.The single gene affects multiple traits and alter the phenotype of the organism.
- 2.Mendel performing breeding experiment with pea plant(*Pisum sativum*).
- 3.The three traits such as flower colour, seed colour and leaf axil are inherited together as a single unit.
- 4.Three traits controlled by a single gene with dominant and recessive alleles.
- 5.Example: Sickle cell anemia.

37. Bring out the inheritance of chloroplast gene with an example.

- 1.In 4'O clock plant (*Mirabilis jalapa*) has dark green and pale green leaves.
- 2.The F1 generation of both the crosses must be identical as per Mendelian inheritance.
- 3.But in the reciprocal cross the F1 plant differs form each other.
- 4.In each cross, the F1 plant reveals the character of the plant which is used as female plant.
- 5.This inheritance is not through nuclear gene.

(i) Pale green leaved male plant X Dark green leaved female plant

↓
F1- Dark green leaved

(ii) Dark green leaved male plant X Pale green leaved female plant

↓
F1- Pale green leaved

I.One mark Answers:-

- 1.a) Mitochondria and chloroplasts
- 2.d) aabb (Errata)
- 3.d) Two
- 4.c) Pod shape in garden pea
- 5.d) Round seeds with yellow cotyledons and wrinkled seeds with yellow cotyledons
- 6.c) Crossing the F1 hybrid with a double recessive genotype
- 7.d) 50:50
- 8.b) Test cross
- 9.a) Tightly linked genes on the same chromosomes show very few combinations
- 10.d) Co-dominance
- 11.b) Dominant epistasis
- 12.c) Pod length
- 13.b) Interaction between two alleles of different loci
- 14.c) The two genes are linked and present on the same chromosome
- 15.d) Four
- 16.c) Law of independent assortment
- 17.c) Law of segregation
- 18.a) Epistatic
- 19.b) Inheritance
- 20.b) 12:3:1
- 21.a) 1856 - 1863
- 22.b) Trichomal glandular or non-glandular

Unit-VII: Genetics

Chapter-3. Chromosomal Basis of Inheritance

Book back Answers

I. One mark questions:-

- An allohexaploidy contains
 - Six different genomes
 - Six copies of three different genomes
 - Two copies of three different genomes
 - Six copies of one genome
- Match list I with list II

List-I	List-II
A. A pair of chromosomes extra with diploid	i) Monosomy
B. One chromosome extra to the diploid	ii) Tetrasomy
C. One chromosome loses from diploid	iii) Trisomy
D. Two individual chromosomes lose from diploid	iv) Double monosomy

 - A-i, B-iii, C-ii, D-iv
 - A-ii, B-iii, C-iv, D-i
 - A-ii, B-iii, C-i, D-iv
 - A-iii, B-ii, C-i, D-iv
- Which of the following sentences are correct?
 - The offspring exhibit only parental combinations due to incomplete linkage
 - The linked genes exhibit some crossing over in complete linkage
 - The separation of two linked genes are possible in incomplete linkage
 - Crossing over is absent in complete linkage
 - 1 and 2
 - 2 and 3
 - 3 and 4
 - 1 and 4
- Due to incomplete linkage in maize, the ratio of parental and recombinants are
 - 50:50
 - 7:1:1:7
 - 96.4: 3.6
 - 1:7:7:1
- The point mutation sequence for transition, transition, transversion and transversion in DNA are
 - A to T, T to A, C to G and G to C
 - A to G, C to T, C to G and T to A
 - C to G, A to G, T to A and G to A
 - G to C, A to T, T to A and C to G
- If haploid number in a cell is 18. The double monosomic and trisomic number will be
 - 35 and 37
 - 34 and 35
 - 37 and 35
 - 17 and 19
- Changing the codon AGC to AGA represents
 - missense mutation
 - nonsense mutation
 - frameshift mutation
 - deletion mutation
- Assertion (A): Gamma rays are generally use to induce mutation in wheat varieties.
Reason (R): Because they carry lower energy to non-ionize electrons from atom
 - A is correct. R is correct explanation of A
 - A is correct. R is not correct explanation of A
 - A is correct. R is wrong explanation of A
 - A and R is wrong

II. Two, Three, Five Mark Questions:-

9. When two different genes came from same parent they tend to remain together.

i) What is the name of this phenomenon?

This phenomenon is called as coupling or cis configuration.

ii) Draw the cross with suitable example.

Parent Generation:	Purple flower Long pollen (PPLL)	X	Red flower round pollen (ppll)					
Gametes:	(PL)	↓	(pl)					
F ₁ generation:	Purple flower long pollen (PpLl)							
Test cross:	PpLl	X	ppll					
Gametes:	PL	Pl	pL	ppl				
F ₂ generation:	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td>PpLl</td> <td>Ppll</td> <td>pPLl</td> <td>ppll</td> </tr> </table>				PpLl	Ppll	pPLl	ppll
PpLl	Ppll	pPLl	ppll					

Phenotype: Purple long : Purple round : Red long : Red round

Observed frequency: 44 : 6 : 6 : 44

Observed ration: 7 : 1 : 1 : 7

Expected ration: 1:1:1:1

iii) Write the observed phenotypic ratio.

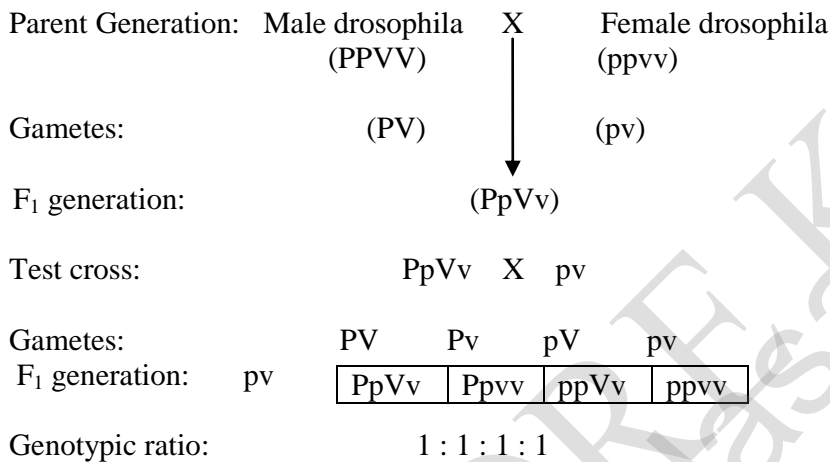
Observed phenotypic ration is 7:1:1:7

10. If you cross dominant genotype PV/PV male *Drosophila* with double recessive female and obtain F1 hybrid. Now you cross F1 male with double recessive female.

i) What type of linkage is seen?

Incomplete linkage

ii) Draw the cross with correct genotype.



iii) What is the possible genotype in F₂ generation?

PpVv	PpVv	ppVv	ppVv
------	------	------	------

11. What is the difference between missense and nonsense mutation?

Missense mutation	Nonsense mutation
One amino acid codon is changed into a amino acid codon.	One amino acid codon is changed into a termination or stop codon.

12. A B C C B D E F G H I I

From the above figure identify the type of mutation and explain it.

- The above figure is identified as Reverse tandem duplication.
- The duplicated segment is located immediately after the normal segment.
- But the gene sequence order will be reversed.

13. Write the salient features of Sutton and Boveri concept or Write the salient features of chromosomal theory of inheritance.

- Somatic cells are derived from zygote.
- These somatic cells are consists of two identical set of chromosomes.
- In this chromosomes one is received from male parent and another one is received from female parent. It is called as homologous chromosomes.
- Chromosomes are maintaining the individuality of an organism.
- Gene locations are identified in the chromosome by the process of meiosis.

14. Explain the mechanism of crossing over.**Crossing over:**

The interchanging of corresponding segments between nonsister chromatids of homologous chromosomes is called crossing over.

Mechanism of crossing over:

It takes place by the following four stages. Such as..

- i) Synapsis ii) Tetrad formation iii) Cross over iv) Terminalization.

i) Synapsis:

1. It takes place by zygotene stage of prophase-I of meiosis-I.
2. In this stage homologous chromosomes are aligned side by side and form bivalent chromosomes.
3. This pairing process is called synapsis or syndesis.

ii) Tetrad formation:

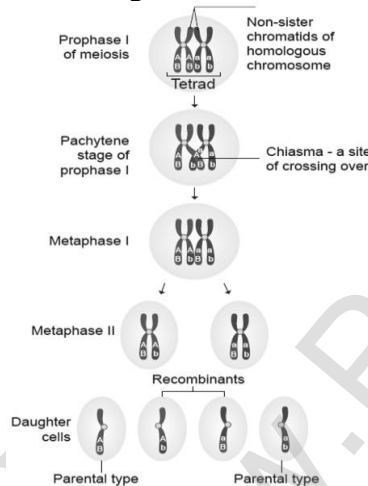
1. Bivalent chromosomes are formed from two identical sister chromatids.
2. At this stage each bivalent has four chromatids.
3. This four chromatid stage is called tetrad stage.

iii) Crossing over:

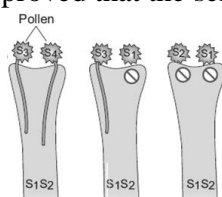
1. Crossing over takes place in pachytene stage.
2. The interchanging of corresponding segments between nonsister chromatids of homologous chromosomes is called crossing over.
3. The adjacent nonsister chromatids are joined together at certain points called chiasmata.

ii) Terminalization:

1. After crossing over, chiasma starts to move towards the terminal end of chromatids.
2. This process is known as terminalization.
3. Finally, complete homologous chromosomes are formed.

**15. How is Nicotiana (Tobacco) exhibit self-incompatibility? or Write the self-sterility in Nicotiana. Explain its mechanism.**

1. East observed multiple alleles are responsible for self-incompatibility of Nicotiana in 1925.
2. The gene for self-incompatibility can be designated as S, which has allelic series S_1, S_2, S_3, S_4, S_5 and S_6 .
3. The cross-fertilizing tobacco plants are not always homozygous as S_1S_1 or S_2S_2 .
4. But all plants are heterozygous as S_1S_2, S_3S_4, S_5S_6 .
5. When crosses are made between different S_1S_2 plants, the pollen tube did not develop normally.
6. But effective pollen tube development was observed in other than S_1S_2 cross.
7. The cross between $S_1S_2 \times S_3S_4$, all the pollens are effectively germinating.
8. Hence, this experiment proved that the self-incompatibility of Nicotiana.



16. How sex is determined in monoecious plants or Explain Sex determination in maize. Write their genes involved in it.

1. Zea mays is an example for monoecious plant. Which means male and female flowers are present in the same plant.
2. Zea mays consist of two different types of inflorescence. The terminal inflorescence bears staminate florets (tassel) and lateral inflorescence bears pistillate floret (ear or cob).
3. 'ba' allele is responsible for male flower and 'ts' allele is responsible for female flower.
4. The allele 'ba' is transformed pistillate flower into tassel flower.
5. The allele 'ts' is transformed tassel flower into pistillate flower.
6. This type of mutations are takes place by the deficiency of gibberellin hormones.
7. Gibberellin hormones are play an important role in the suppression of stamens in florets on the ears.

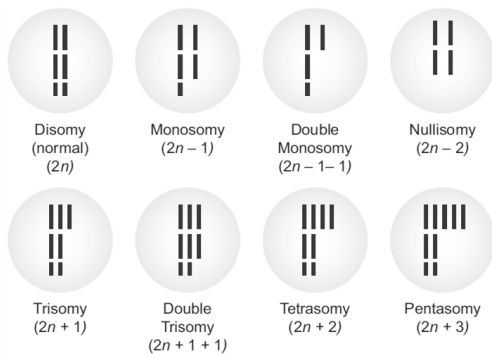
17. What is gene mapping? Write its uses.

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

Uses of gene mapping:

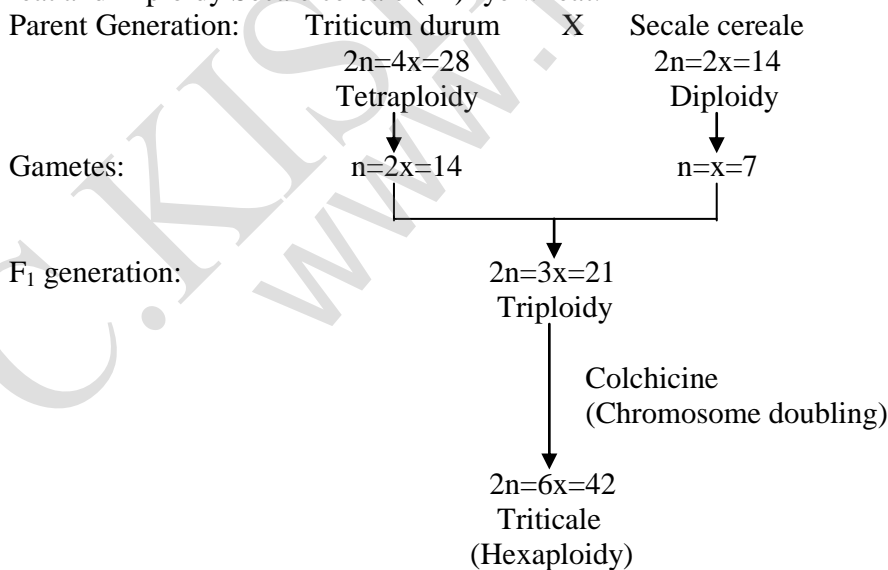
1. It is useful to determine the gene order.
2. It is useful to predict the results of dihybrid and trihybrid crosses.
3. It is used to understand the genetic complexity of particular organism.
4. It is useful to determine the location, arrangement and linkage of genes in a chromosome.

18. Draw the diagram of different types of aneuploidy.

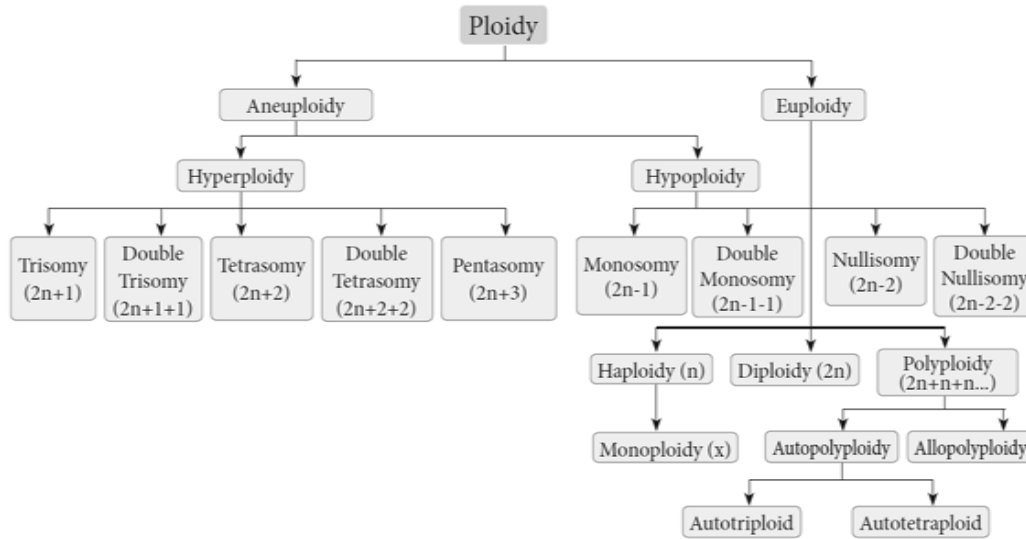


19. Mention the name of man-made cereal. How it is formed? or Explain the Allopolyploidy breeding.

1. The successful first man made cereal is Triticale (wheat variety).
2. It is an good example for allopolyploidy breeding.
3. The Hexaploidy Triticale (6x) was produced by the cross between Tetraploidy Triticum durum (4x) macaroni wheat and Diploidy Secale cereale (2x) rye wheat.



Write the flow chart of Ploidy (Extra question).



I. One mark Answers:-

- 1.c) Two copies of three different genomes
- 2.c) A-ii, B-iii, C-i, D-iv
- 3.c) 3 and 4
- 4.c) 96.4: 3.6
- 5.b) A to G, C to T, C to G and T to A
- 6.a) 35 and 37 (Errata)
- 7.a) missense mutation
- 8.c) A is correct. R is wrong explanation of A

Unit-VIII: Biotechnology

Chapter-4. Principles and Processes of Biotechnology

Book back Answers

I. One mark questions:-

- Restriction enzymes are
 - Not always required in genetic engineering
 - Essential tools in genetic engineering
 - Nucleases that cleave DNA at specific sites
 - both b and c
- Plasmids are
 - circular protein molecules
 - required by bacteria
 - tiny bacteria
 - confer resistance to antibiotics
- EcoRI cleaves DNA at
 - AGGGTT
 - GTATATC
 - GAATTC
 - TATAGC
- Genetic engineering is
 - making artificial genes.
 - hybridization of DNA of one organism to that of the others.
 - production of alcohol by using micro organisms.
 - making artificial limbs, diagnostic instruments such as ECG, EEG etc.,
- Consider the following statements:
 - Recombinant DNA technology is popularly known as genetic engineering is a stream of biotechnology which deals with the manipulation of genetic materials by man invitro
 - pBR322 is the first artificial cloning vector developed in 1977 by Boliver and Rodriguez from E.coli plasmid
 - Restriction enzymes belongs to a class of enzymes called nucleases.
 Choose the correct option regarding above statements
 - I & II
 - I & III
 - II & III
 - I,II & III
- The process of recombinant DNA technology has the following steps
 - amplication of the gene
 - Insertion of recombinant DNA into the host cells
 - Cutting of DNA at specific location using restriction enzyme .
 - Isolation of genetic material (DNA) Pick out the correct sequence of step for recombinant DNA technology.
 - II, III, IV, I
 - IV, II, III, I
 - I, II, III, IV
 - IV, III, I, II
- Which one of the following palindromic base sequence in DNA can be easily cut at about the middle by some particular restriction enzymes?
 - 5' CGTTCG 3' 3' ATCGTA 5'
 - 5' GATATG 3' 3' CTAATA 5'
 - 5' GAATTC 3' 3' CTTAAG 5'
 - 5' CACGTA 3' 3' CTCAGT 5'
- pBR 322, BR stands for
 - Plasmid Bacterial Recombination
 - Plasmid Bacterial Replication
 - Plasmid Boliver and Rodriguez
 - Plasmid Baltimore and Rodriguez
- Which of the following one is used as a Biosensors?
 - Electrophoresis
 - Bioreactors
 - Vectors
 - Electroporation

10. Match the following :

Column A	Column B	
1.Exonuclease	a. add or remove phosphate	1 2 3 4 A) a b c d
2.Endonuclease	b. binding the DNA fragments	B) c d b a
3.Alkaline Phosphatase	c. cut the DNA at terminus	C) a c b d
4.Ligase	d. cut the DNA at middle	D) c d a b

- In which techniques Ethidium Bromide is used?
 - Southern Blotting techniques
 - Western Blotting techniques
 - Polymerase Chain Reaction
 - Agrose Gel Electroporosis
- Assertion :** Agrobacterium tumifaciens is popular in genetic engineering because this bacterium is associated with the root nodules of all cereals and pulse crops
Reason: A gene incorporated in the bacterial chromosomal genome gets automatically transferred to the cross with which bacterium is associated.
 - Both assertion and reason are true. But reason is correct explanation of assertion.
 - Both assertion and reason are true. But reason is not correct explanation of assertion.
 - Assertion is true, but reason is false.
 - Assertion is false, but reason is true.
 - Both assertion and reason are false.

13. Which one of the following is not correct statement.
- Ti plasmid causes the bunchy top disease
 - Multiple cloning site is known as Polylinker
 - Non viral method transfection of Nucleic acid in cell
 - Poly lactic acid is a kind of biodegradable and bioactive thermoplastic.
14. An analysis of chromosomal DNA using the southern hybridisation technique does not use
- Electrophoresis
 - Blotting
 - Autoradiography
 - Polymerase Chain Reaction
15. An antibiotic gene in a vector usually helps in the selection of
- Competent cells
 - Transformed cells
 - Recombinant cells
 - None of the above
16. Some of the characteristics of Bt cotton are
- Long fibre and resistant to aphids
 - Medium yield, long fibre and resistant to beetle pests.
 - high yield and production of toxic protein crystals which kill dipteran pests.
 - High yield and resistant to ball worms.

II. Two, Three, Five Mark Questions:-

17. How do you use the biotechnology in modern practice?

- Biotechnology used in enzyme and biomass production.
- It is used to produce enzymes, antibiotic and vitamins.
- It is used in biofuel production.
- Biotechnology play a vital role in production of biofertilisers.
- It is also used in Recombinant DNA technology.

18. What are the materials used to grow microorganism like Spirulina?

Spirulina like microorganisms are easily growing in straw, molasses, animal manure and sewage.

19. You are working in a biotechnology lab with a bacterium namely E.coli. How will you cut the nucleotide sequence? explain it.

- Restriction enzymes are extracted from E.coli bacteria. It is also called as molecular scissors.
- There are three class of restriction endonuclease. such as... Type-I, Type-II and Type-III.
- Type-II enzymes only used in recombinant DNA technology.
- This enzyme recognise and cut the DNA in a specific nucleotide sequence.
- This enzyme consisting of 4 to 8 base pairs.

20. What are the enzymes you can used to cut terminal end and internal phospho-di-ester bond of nucleotide sequence?

- Exonuclease enzymes are used to cut the terminal end of nucleotide sequence.
Examples: Bal 31 and Exonuclease-III
- Endonuclease enzymes are used to cut the internal phospho-di-ester bond of nucleotide sequence.
Examples: Hind-II and EcoR-I.

21. Name the chemicals used in gene transfer.

Polyethylene glycol (PEG) and Dextran sulphate are used in gene transfer.

22. What do you know about the word pBR 322?

- pBR 322 plasmid is a reconstructed plasmid. It is widely used cloning vector.
- It contains 4361 base pairs.
- In pBR, p denotes plasmid, B and R denotes the names of scientist Boliver and Rodriguez who developed this plasmid.
- The number 322 is the number of plasmid developed from their laboratory.
- It contains amp^R and tet^R two different antibiotic resistance genes and recognition sites for several restriction enzymes.

23. Mention the application of Biotechnology.

- Biotechnology is widely used in various fields like agriculture, medicine, environment and commercial industries.
- It is used in pesticide resistant, stress resistant and disease resistant varieties in agricultural crops.
- E.coli bacteria is used to produce human insulin for insulin deficiency disorder in human beings.
- Single cell protein from Spirulina is utilized in food industries.
- Biotechnology also used in secondary metabolites, biofertilizers, biopesticides and enzymes production.
- Biochip based biological computer is one of the success of biotechnology.
- Biomass energy, biofuel and bioremediation techniques are done by the environmental biotechnology.

24. What are restriction enzyme. Mention their type with role in Biotechnology.

- 1.Restriction enzymes are extracted from E.coli bacteria.
- 2.Restriction enzyme or restriction endonuclease is an enzyme that cut the DNA in a specific site.
- 3.Restriction enzymes are also called as molecular scissors.

Types of restriction enzyme:

Based on their mode of action restriction enzymes are classified into two types.

- 1.Exonuclease and 2.Endonucleas.

1.Exonuclease enzymes are used to cut the terminal end of nucleotide sequence.

Examples: Bal 31 and Exonuclease-III

2.Endonucleas enzymes are used to cut the internal phospho-di-ester bond of nucleotide sequence.

Examples: Hind-II and EcoR-I.

Three main classes of restriction enzyme:

1.There are three main class of restriction endonuclease. such as... Type-I, Type-II and Type-III.

2.Type-II enzymes only used in recombinant DNA technology.

3.This enzyme recognise and cut the DNA in a specific nucleotide sequence.

4.This enzyme consisting of 4 to 8 base pairs.

25. Is their any possibilities to transfer a suitable desirable gene to host plant without vector? Justify your answer. or Explain the direct or vectorless gene transfer method.

Yes, It is possible through the direct or vectorless gene transfer method.

Direct or vectorless gene transfer methods:**1.Chemical mediated gene transfer:**

Certain chemicals like polyethylene glycol (PEG) and dextran sulphate induce DNA uptake into plant protoplasts.

2.Microinjection:

The DNA is directly injected into the nucleus using fine tipped glass needle or micro pipette to transform plant cells.

3.Electroporation Methods of Gene Transfer:

1.A pulse of high voltage is applied to protoplast.

2.Cells or tissues which makes transient pores in the plasmamembrane through which uptake of foreign DNA occurs.

4.Liposome mediated method of Gene Transfer:

1.Liposomes the artificial phospholipid vesicles are useful in gene transfer.

2.The gene or DNA is transferred from liposome into vacuole of plant cells.

5.Biolistics:

1.The foreign DNA is coated onto the surface of minute gold or tungsten particles.

2.Bombarded onto the target tissue or cells using a gene gun or micro projectile gun.

26. How will you identify a vectors?

1.It should be small in size and low molecular weight, less than 10 kb.

2.It can independently replicate within the host cell.

3.It should contain a suitable marker for antibiotic resistance.

4.Vector must contain an origin of replication.

5.Cloning vectors have more than one restriction site.

27. Compare the various types of Blotting techniques.

Chracters	Southern blotting	Northern blotting	Western blotting
Name	It is name of an inventor	It is a misnomer	It is a misnomer
Separation of	DNA	RNA	Proteins
Denaturation	Needed	Not needed	Needed
Membrane	Nitrocellulose	Amino benzyloxy methyl	Nitrocellulose
Hybridisation	DNA-DNA	RNA-DNA	Protein-antibody
Visualising	Autoradiogram	Autoradiogram	Dark room

28. Write the advantages of herbicide tolerant crops.

- 1.It improves the crop yielding.
- 2.It reduces the herbicides.
- 3.It improve the soil fertility.
- 4.It reduce the environmental toxicity.
- 5.It conserve the soil living microorganisms.

29. Write the advantages and disadvantages of Bt cotton.**Advantages:**

- 1.It improves the crop yielding.
- 2.It reduces the insecticide.
- 3.It reduce the cultivation cost.

Disadvantages:

- 1.Cost of Bt cotton seed is high.
- 2.Effectiveness is only 120 days, after that efficiency is reduced.
- 3.Ineffective against sucking pests.
- 4.Affects the pollinating insects.

30. What is bioremediation? give some examples of bioremediation.**Bioremediation:**

It is defined as the use of microorganisms or plants to clean up our environmental pollution.

Examples of Bioremediation:**1.Phytoremediation:**

Use the plants to clean up our environmental pollutants.

2.Mycoremediation:

Use the fungi to clean up our environmental pollutants.

3.Bioventing:

Increase the oxygen or air flow to accelerate the degradation of environmental pollutants.

4.Bioleaching:

Use the microorganisms to remove the metal pollutants from contaminated sites.

5.Composting:

Solid waste is composted by the microorganisms into manure. which acts as a nutrient for plant growth.

31. Write the benefits and risk of Genetically Modified Foods.**Benefits:**

- 1.High yield without pest.
- 2.70% reduction of pesticide usage.
- 3.Reduce soil pollution problem.
- 4.Conserve microbial population in soil.

Risks:

- 1.Affect liver, kidney function and causes cancer.
- 2.Hormonal imbalance and physical disorder.
- 3.Anaphylactic shock (sudden hypersensitive reaction) and allergies.
- 4.Adverse effect in immune system because of bacterial protein.
- 5.Reduce the seed viability.

I.One mark Answers:-

- 1.d. both b and c
- 2.d. confer resistance to antibiotics
- 3.c. GAATTC
- 4.b. hybridization of DNA of one organism to that of the others.
- 5.d. I,II & III
- 6.d. IV, III, I, II
- 7.c. 5' GAATTC 3' 3' CTTAAG 5'
- 8.c. Plasmid Boliver and Rodriguez
- 9.b. Bioreactors
- 10.D) c d a b
- 11.d. Agrose Gel Electroporosis
- 12.d) Assertion is false, but reason is true.
- 13.b) Multiple cloning site is known as Polylinker
- 14.d) Polymerase Chain Reaction
- 15.b) Transformed cells
- 16.d) High yield and resistant to ball worms.

Unit-VIII: Biotechnology
Chapter-5. Plant Tissue Culture
Book back Answers

I. One mark questions:-

- Totipotency refers to
 - capacity to generate genetically identical plants.
 - capacity to generate a whole plant from any plant cell / explant.
 - capacity to generate hybrid protoplasts.
 - recovery of healthy plants from diseased plants.
- Micro propagation involves
 - vegetative multiplication of plants by using micro-organisms.
 - vegetative multiplication of plants by using small explants.
 - vegetative multiplication of plants by using microspores.
 - Non-vegetative multiplication of plants by using microspores and megaspores.
- Match the following

Column A	Column B
1) Totipotency	A) Reversion of mature cells into meristem
2) Dedifferentiation	B) Biochemical and structural changes of cells
3) Explant	C) Properties of living cells develops into entire plant
4) Differentiation	D) Selected plant tissue transferred to culture medium

- | | | | | |
|----|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| a) | C | A | D | B |
| b) | A | C | B | D |
| c) | B | A | D | C |
| d) | D | B | C | A |
- The time duration for sterilization process by using autoclave is _____ minutes and the temperature is _____.
 - 10 to 30 minutes and 125° C
 - 15 to 30 minutes and 121° C
 - 15 to 20 minutes and 125° C
 - 10 to 20 minutes and 121° C
 - Which of the following statement is correct
 - Agar is not extracted from marine algae such as seaweeds.
 - Callus undergoes differentiation and produces somatic embryoids.
 - Surface sterilization of explants is done by using mercuric bromide
 - pH of the culture medium is 5.0 to 6.0
 - Select the incorrect statement from given statement
 - A tonic used for cardiac arrest is obtained from Digitalis purpuria
 - Medicine used to treat Rheumatic pain is extracted from Capsicum annum
 - An anti malarial drug is isolated from Cinchona officinalis.
 - Anti-carcinogenic property is not seen in Catharanthus roseus.
 - Virus free plants are developed from
 - Organ culture
 - Meristem culture
 - Protoplast culture
 - Cell suspension culture
 - The prevention of large scale loss of biological integrity
 - Biopatent
 - Bioethics
 - Biosafety
 - Biofuel
 - Cryopreservation means it is a process to preserve plant cells, tissues or organs
 - At very low temperature by using ether.
 - At very high temperature by using liquid nitrogen
 - At very low temperature of -196 by using liquid nitrogen
 - At very low temperature by using liquid nitrogen
 - Solidifying agent used in plant tissue culture is
 - Nicotinic acid
 - Cobaltous chloride
 - EDTA
 - Agar

II. Two, Three, Five Mark Questions:-**11. What is the name of the process given below? Write its 4 types.**

- (i) This is the basic steps of plant tissue culture technology.
- (ii) There are four different types of plant tissue culture techniques. Such as..
 1. Organ culture
 2. Meristem culture
 3. Protoplast culture
 4. Cell culture.

12. How will you avoid the growing of microbes in nutrient medium during culture process?**What are the techniques used to remove the microbes?**

- (i) Culture media are dispensed in glass containers, plugged with non-absorbent cotton or sealed with plastic closures and then sterilized using autoclave at 15 psi (121°C) for 15 to 30 minutes.
- (ii) There are two different methods are used to remove the microbes in culture medium such as ...
 1. Physical method
 2. Chemical method.

13. Write the various steps involved in cell suspension culture.

- (i) Culture of a single cell in vitro in liquid medium is known as cell suspension culture.
- (ii) The cell suspension is prepared by transferring a portion of callus to the liquid medium and agitated using rotary shaker instrument.
- (iii) The cells are separated from the callus tissue and used for cell suspension culture.

14. What do you mean Embryoids? Write its application.

- (i) The callus cells undergoes differentiation and produces somatic embryos known as Embryoids.
- (ii) The embryoids are sub-cultured to produce plantlets.

15. Give the examples for micro propagation performed plants.

1. Potato
2. Banana
3. Pineapple
4. Strawberry

16. Explain the basic concepts involved in plant tissue culture.

There are four different basic concepts are involved in plant tissue culture technique. Such as...

1. Totipotency
2. Differentiation
3. Redifferentiation
4. Dedifferentiation.

1. Totipotency:

A living plant cell cultured in a nutrient medium to produce a complete individual plant is called totipotency.

2. Differentiation:

A cell become specialized form and function through the biochemical and structural changes is called differentiation.

3. Redifferentiation:

The further differentiation of already differentiated cell into another type of cell is called redifferentiation.

4. Dedifferentiation:

The reversal of mature cell into meristematic cell to form callus tissue is called dedifferentiation.

17. Based on the material used, how will you classify the culture technology? Explain it.

Based on the material used, Plant tissue culture technology is classified into following four different types. Such as.. 1.Organ culture 2.Meristem culture 3.Protoplast culture 4.Cell Suspension culture.

1.Organ culture:

Cultivation of root, shoot, anther and embryos in a culture medium is called organ culture.

2.Meristem culture:

Cultivation of meristematic tissue in a culture medium is called meristem culture.

3.Protoplast culture:

Protoplast from a single cell to produce a whole plant and develop into somatic hybrids is called protoplast culture.

4.Cell Suspension culture:

Culture of a single cell in vitro in liquid medium is known as cell suspension culture.

18. Give an account on Cryopreservation.

- (i) Cell, tissue, organs or any other biological materials are preserved in a very low temperature of -196°C by using liquid nitrogen is called Cryopreservation.
- (ii) At this extreme low temperature any enzymatic or chemical activity of the biological material will be totally stopped.
- (iii) Later these materials can be activated by bringing into room temperature slowly for any other experimental work.
- (iv) Protective agents like dimethyl sulphoxide, glycerol or sucrose are added before cryopreservation process.
- (v) These protective agents are called cryoprotectants.

19. What do you know about Germplasm conservation? Describe it.

- (i) The collection of seeds and pollens that are stored in a seed bank or pollen banks is called Germplasm Conservation.
- (ii) Plants viability and fertility maintained by this Germplasm conservation.
- (iii) It will helpful for plant hybridization and crop improvement.
- (iv) Germplasm conservation used to maintain the biological diversity and food security process.

20. Write the protocol for artificial seed preparation.

- (i) Artificial seeds or synthetic seeds are produced by using embryoids obtained through in vitro culture.
- (ii) It can be derived from any part of the plants.
- (iii) These cells are later divided into large nucleus and dense cytoplasm.
- (iv) Agrose and sodium alginate are used for coating the somatic embryoids.

Advantages of Artificial seeds:

- (i) Artificial seeds are produced by low cost.
- (ii) Artificial seeds can be produced with desirable characters.
- (iii) It is easy to test the plants genotype.
- (iv) It can be potentially stored through cryopreservation method.
- (v) It produces identical plants.

I. One mark Answers:-

1. b) capacity to generate a whole plant from any plant cell / explant.
2. b) vegetative multiplication of plants by using small explants.
3. a) C A D B
4. b) 15 to 30 minutes and 121°C
5. b) Callus undergoes differentiation and produces somatic embryoids.
6. d) Anti-carcinogenic property is not seen in *Catharanthus roseus*.
7. b) Meristem culture
8. c) Biosafety
9. c) At very low temperature of -196 by using liquid nitrogen
10. d) Agar

Unit-IX: Plant Ecology

Chapter-6. Principles of Ecology

Book back Answers

I. One mark questions:-

- Arrange the correct sequence of ecological hierarchy starting from lower to higher level.
 - Individual organism → Population Landscape → Ecosystem
 - Landscape → Ecosystem → Biome → Biosphere
 - community → Ecosystem → Landscape → Biome
 - Population → organism → Biome → Landscape
- Ecology is the study of an individual species is called
 - Community ecology
 - Autecology
 - Species ecology
 - Synecology
 - i only
 - ii only
 - i and iv only
 - ii and iii only
- A specific place in an ecosystem, where an organism lives and performs its functions is
 - habitat
 - niche
 - landscape
 - biome
- Read the given statements and select the correct option.
 - Hydrophytes possess aerenchyma to support themselves in water.
 - Seeds of *Viscum* are positively photoblastic as they germinate only in presence of light.
 - Hygroscopic water is the only soil water available to roots of plant growing in soil as it is present inside the micropores.
 - High temperature reduces use of water and solute absorption by roots.
 - i, ii, and iii only
 - ii, iii and iv
 - ii and iii only
 - i and ii only
- Which of the given plant produces cardiac glycosides?
 - Calotropis*
 - Acacia*
 - Nepenthes*
 - Utricularia*
- Read the given statements and select the correct option.
 - Loamy soil is best suited for plant growth as it contains a mixture of silt, sand and clay.
 - The process of humification is slow in case of organic remains containing a large amount of lignin and cellulose.
 - Capillary water is the only water available to plant roots as it is present inside the micropores.
 - Leaves of shade plant have more total chlorophyll per reaction centre, low ratio of chl *a* and chl *b* are usually thinner leaves.
 - i, ii and iii only
 - ii, iii and iv only
 - i, ii and iv only
 - ii and iii only
- Read the given statements and select the correct option.

Statement A : Cattle do not graze on weeds of *Calotropis*.

Statement B : *Calotropis* have thorns and spines, as defense against herbivores.

 - Both statements A and B are incorrect.
 - Statement A is correct but statement B is incorrect.
 - Both statements A and B are correct but statement B is not the correct explanation of statement A.
 - Both statements A and B are correct and statement B is the correct explanation of statement A.
- In soil water available for plants is
 - Gravitational water
 - Chemically bound water
 - Capillary water
 - Hygroscopic water
- Read the following statements and fill up the blanks with correct option.
 - Total soil water content in soil is called _____
 - Soil water not available to plants is called _____
 - Soil water available to plants is called _____

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

10. Column I represent the size of the soil particles and Column II represents type of soil components.

Which of the following is correct match for the Column I and Column II

Column-I	Column-II
I) 0.2 to 2.00 mm	i) Slit soil
II) Less than 0.002 mm	ii) Clayey soil
III) 0.002 to 0.02 mm	iii) Sandy soil
IV) 0.002 to 0.2 mm	iv) Loamy soil

	(I)	(II)	(III)	(IV)
a)	ii	iii	iv	i
b)	iv	i	iii	ii
c)	iii	ii	i	iv
d)	None of the above			

11. The plant of this group are adapted to live partly in water and partly above substratum and free from water

a) Xerophytes b) Mesophytes c) Hydrophytes d) Halophytes

12. Identify the A, B, C and D in the given table

Interaction	Effects on species X	Effects on species Y
Mutualism	A	(+)
B	(+)	(-)
Competition	(-)	C
D	(-)	0

	A	B	C	D
a)	(+)	Parasitism	(-)	Amensalism
b)	(-)	Mutalism	(+)	Competition
c)	(+)	Competition	(0)	Mutalism
d)	(0)	Amensalism	(+)	Parasitism

13. *Ophrys* an orchid resembling the female of an insect so as to able to get pollinated is due to phenomenon of
a) Myrmecophily b) Ecological equivalents c) Mimicry d) None of these
14. A free living nitrogen fixing cyanobacterium which can also form symbiotic association with the water fern *Azolla*
a) *Nostoc* b) *Anabaena* c) *Chlorella* d) *Rhizobium*
15. Pedogenesis refers to
a) Fossils b) Water c) Population d) Soil
16. Mycorrhiza promotes plant growth by
a) Serving as a plant growth regulators b) Absorbing inorganic ions from soil
c) Helping the plant in utilizing atmospheric nitrogen d) Protecting the plant from infection
17. Which of the following plant has a non-succulent xerophytic and thick leathery leaves with waxy coating
a) *Bryophyllum* b) *Ruscus* c) *Nerium* d) *Calotropis*
18. In a fresh water environment like pond, rooted autotrophs are
a) *Nymphaea* and *typha* b) *Ceratophyllum* and *Utricularia* c) *Wolffia* and *pistia* d) *Azolla* and *lemma*
19. Match the following and choose the correct combination from the options given below:

Column-I (Interaction)	Column-II (Examples)
I) Mutualism	i) Trichoderma and Penicillium
II) Commensalism	ii) Balanophora and Orobanche
III) Parasitism	iii) Orchids and Ferns
IV) Predation	iv) Lichen and Mycorrhiza
V) Amensalism	v) Nepenthes and Diaonaea

	I	II	III	IV	V
a)	i	ii	iii	iv	v
b)	ii	iii	iv	v	i
c)	iii	iv	v	i	ii
d)	iv	iii	ii	v	i

20. Strong, sharp spines that get attached to animal's feet are found in the fruits of
a) *Argemone* b) *Ecballium* c) *Heritier* d) *Crossandra*
21. Sticky glands of *Boerhaavia* and *Cleome* support
a) Anemochory b) Zoochory c) Autochory d) Hydrochory

II. Two, Three, Five Mark Questions:-

22. Define ecology.

Ecology is a division of biology which deals with the study of environment in relation to organisms.

23. What is ecological hierarchy? Name the levels of ecological hierarchy.

1. The interaction of organisms with their environment results in the establishment of grouping of organisms which is called ecological hierarchy.

2. Individual organism → Population → Community → Ecosystem → Landscape → Biome → Biosphere.

24. What are Ecological equivalents? Give one example.

Taxonomically different species occupying similar habitats (Niches) in different geographical regions are called Ecological equivalents.

25. Distinguish habitat and niche

Habitat	Niche
1.It is a specific physical space.	It is a functional space.
2.Same habitat shared by many organisms.	A Single niche occupied by a single species.
3.Habitat specificity is exhibited by organisms.	Organisms may change their niche with time and season.

26. Why are some organisms called as Eurythermals and some others as Stenohaline?

1.Organisms which can tolerate a wide range of temperature fluctuations is called Eurythermals.

Example: *Zostera* (A marine Angiosperm).

2.Organisms which can withstand only small range of salinity is called Stenohaline. Example: Plants of estuaries.

27. 'Green algae are not likely to be found in the deepest strata of the ocean'. Give at least one reason.

1.The deeper region of a ocean below the limnetic zone is called profundal zone.

2.In this zone there is no effective sunlight. Hence, green algae are not found in the deepest strata of the ocean.

28. What is Phytoremediation?

Rice, Tomato, Soyabean and Eichhornia plants are used to remove cadmium from contaminated soil. This process is called as Phytoremediation.

29. What is Albedo effect or Green House effect and write their effects?

Aerosols with small particles is reflecting the solar radiation entering the atmosphere. This is known as Albedo effect or Green House effect.

Effects:

1.It reduce the photosynthesis and respiration rate.

2.It creat acid rain.

3.It destroy the ozone layer.

30. The organic horizon is generally absent from agricultural soils because tilling, e.g., plowing, buries organic matter. Why is an organic horizon generally absent in desert soils ?

1.O-Horizon consists of fresh or partially decomposed organic matters.

2.This organic matters are not present in desert regions.

3.Hence, organic horizon is generally absent in desert soils.

31. Soil formation can be initiated by biological organisms. Explain how?

Biological weathering takes place when organisms like bacteria, fungi, lichens and plants help in the breakdown of rocks through the production of acids and certain chemical substances.

32. Sandy soil is not suitable for cultivation. Explain why?

1.Sandy soil is 0.2 to 2 mm in size.

2.Water holding capacity of the sandy soil is very very low.

3.Soil living micro-organisms such as bacteria, fungi and lichens are very less amount in sandy soil.

4.Plants are unable to take water and minerals from sandy soil.

5.Hence, sandy soil is not suitable for cultivation.

33. Describe the mutual relationship between the fig and wasp and comment on the phenomenon that operates in this relationship.

1.The obligate association between fig and wasps is called mutualism.

2.Wasps are help to the fig pollination and fig fruits are help to protect the wasp larvas.

3.In this interaction both the organisms are getting benefits.

34. Lichen is considered as a good example of obligate mutualism. Explain.

1.The obligate association between algae and fungi is called Lichen.

2.Algae provide nutrition to fungi and fungi provide water and minerals to algae.

3.In this interaction both the organisms are getting benefits.

35. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in modern agriculture.

1.The obligate association between two species is called mutualism.

2.In this interaction both the organisms are getting benefits.

3.Example: Anabaena present in Azolla and Nostoc present in Anthoceros.

36. List any two adaptive features evolved in parasites enabling them to live successfully on their host?

- 1.Parasitic plants are produce the haustorial root to absorb nutrients from host plant.
- 2.Parasitic plants are having specialized clinging root to fix their body with host plant.

37. Mention any two significant roles of predation plays in nature.

Many defense mechanisms are evolved to avoid their predations by plants. Such as...

- 1.Calotropis produces highly poisonous cardiac glycosides.
- 2.Tobacco produces nicotine and coffee plants produce caffeine.
- 3.Cinchona plant produces quinine.

38. How does an orchid *Ophrys* ensures its pollination by bees or Define floral mimicry?

- 1.The Ophrys flower looks like a female insect to attract the male insect to get pollinated by the male insect.
- 2.It is also called as 'floral mimicry'.

39. Water is very essential for life. Write any three features for plants which enable them to survive in water scarce environment.

- 1.Root hairs and root caps are well developed.
- 2.Stems are mostly hard and woody.
- 3.Leaves are generally leathery and shiny.
- 4.Example: Opuntia and Acacia.

40. Why do submerged plants receive weak illumination than exposed floating plants in a lake?

- 1.Free floating hydrophytes are occupying the surface of lake. So, enough sunlight is not penetrate to the lake.
- 2.Hence, submerged plants are getting weak illumination than floating plants.

41. What is vivipary? Name a plant group which exhibits vivipary.

- 1.Seeds are germinating in the fruits of mother plant itself is called vivipary.
- 2.Example: Halophytes – Avicennia.

42. What is thermal stratification? Mention their types.

The changes of temperature profile with increasing depth in a water body are called thermal stratification.

Types of thermal stratification:

- 1.Epilimnion – The upper layer of warmer water.
- 2.Metalimnion – The middle layer with a zone of gradual decrease in temperature.
- 3.Hypolimnion - The bottom layer of colder water.

43. How is rhytidome act as the structural defence by plants against fire?

- 1.It is the structural defense by plants against fire
- 2.It is composed of multiple layer of suberized periderm, cortical and phloem tissues.
- 3.It prevent the plant from fire, insects and microorganisms.

44. What is Myrmecophily?

- 1.Pollination takes place by ant is called Myrmecophily.
- 2.Example: Mangifera and Acacia.

45. What is seed ball?

- 1.Preparation of ball like structures with seeds, clay and soil humus is called seed ball.
- 2.It is an ancient Japanese technique.
- 3.It is a suitable method for regeneration of trees at barren lands.

46. How is anemochory differ from zoochory?

Anemochory (Wind)	Zoochory (Animals)
1.Seeds are very small and minute.	Seeds are large in size.
2.Mostly trees are spreading seeds by wind.	Mostly herbs and shrubs are spreading seeds by animals.
3.Seeds are having specialized structures like wings, feathers for dispersal.	Seeds are having specialized structures like Hooks, Sticky nature for dispersal.
4.In this method seeds are spreading through wind.	In this method seeds are spreading through animals.
5.Example: Orchids.	Example: Papaya.

47. What is co-evolution?

- 1.The reciprocal changes of genetic and morphological characters between the two organisms is called co-evolution.
- 2.This changes are continues for many generations.

48. Explain Raunkiaer classification in the world's vegetation based on the temperature.

Based on temperature Raunkiaer classified world's vegetation into four different types. Such as...

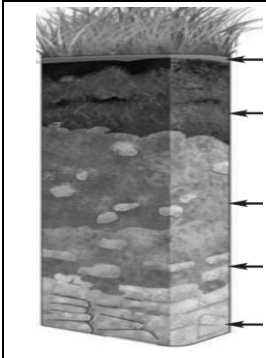
- 1.Megatherms
- 2.Mesotherms
- 3.Microtherms
- 4.Hekistotherms.

49. List out the effects of fire to plants.

- 1.Fire directly affect the plants.
- 2.It change the nature of nutrient cycle and soil fertility.
- 3.It create the chance for entry of parasitic fungus and insects into plants.
- 4.It alternate the nature of soil, light, rainfall and PH level in our environment.
- 5.Burnt soil living fungus are called pyrophilous.

50. What is soil profile? Explain the characters of different soil horizons.

The succession of super-imposed horizons of soil is called soil profile.

Soil profile	Horizon	Description
	O – Horizon (Organic horizon)	O1 – Freshly fallen leaves, flowers and fruits. O2 – Dead plant and animal remains.
	A – Horizon (Leached horizon)	A1 – Organic and mineral matters. A2 – Large size mineral particles.
	B – Horizon (Accumulation horizon)	It consists of iron, aluminium and silica rich clay organic compounds.
	C – Horizon (Partially weathered horizon)	It consists of parent materials of soil without life forms.
	R – Horizon (Parent material)	It consists of parent bed rock with underground water.

51. Give an account of various types of parasitism with examples.

- 1.It is an interaction between two different species.
- 2.In this interaction smaller partner is called parasite and larger partner is called host plant.

Types of parasitism:

Parasitism is classified into two different types they are...

- 1.Holoparasites or Total parasites
- 2.Hemiparasites or Partial parasites.

1.Holoparasites or Total parasites:

- 1.The organisms which are depends on host plant for their entire nutrition are called holoparasites or total parasites.
- 2.Example: Cuscuta.

2.Hemiparasites or Partial parasites:

- 1.The organisms which are getting water and minerals from their host plant and synthesis their own food by photosynthesis are called hemiparasites or partial parasites.
- 2.Example: Viscum and Santalum (Sandal wood).

52. Explain different types of hydrophytes with examples.**Hydrophytes:**

The plants which are living in water are called hydrophytes.

Types of Hydrophytes:

Hydrophytes are classified into five different types such as...

- i) Free floating hydrophytes
- ii) Rooted- floating hydrophytes
- iii) Submerged floating hydrophytes
- iv) Rooted -submerged hydrophytes
- v) Amphibious hydrophytes

i) Free floating hydrophytes:

- 1.These plants are free floating on the surface of water and not contact with soil.
- 2.Example: Eichhornia, Pistia and Wolffia (Smallest flowering plant).

ii) Rooted- floating hydrophytes:

- 1.These plants roots are fixed with soil. Plant leaves, flowers are floating on the surface of water.
- 2.Example: Nelumbo, Nymphaea, Potamogeton and Marsilea.

iii) Submerged floating hydrophytes:

1. These plants are completely submerged in water and not contact with soil.
2. Example: Ceratophyllum and Utricularia.

iv) Rooted -submerged hydrophytes:

1. These plants are completely submerged in water and contact with soil.
2. Example: Hydrilla, Vallisneria and Isoetes.

v) Amphibious hydrophytes:

1. These plants are living in both aquatic and terrestrial regions.
2. Example: Ranunculus, Typha and Sagittaria.

53. Enumerate the anatomical adaptations of xerophytes.

1. Presence of heavy cuticle to prevent water loss.
2. Hypodermis and Vascular bundles are well developed.
3. Sunken stomata is present.
4. Mesophyll tissue is differentiated into palisade and spongy parenchyma.
5. Stem contain water storage region.

54. List out any five morphological adaptations of halophytes.

1. They are mostly bushy and herbaceous.
2. Specialized negative geotropic breathing roots (Pneumatophores) are present.
3. Aerial parts contain thick cuticle.
4. Some plants are aphyllous (without leaves).
5. Vivipary mode of seed germination is present. Example: Avicennia.

55. What are the advantages of seed dispersal?

1. Plants are avoiding predation and competition through seed dispersal.
2. It assist the successful seed germination.
3. It helps the conservation of plants.
4. Seed dispersal create the new ecosystem.
5. It protect our biodiversity.

56. Describe dispersal of fruit and seeds by animals.

1. The transport of fruit and seeds by animals is called Zoochory.
2. Plants are having specialized adaptations for fruit and seed dispersal. Such as...

Special adaptations of Plants for seed dispersal:

1. Hooked fruit.
2. Sticky fruits and seeds.
3. Fleshy fruits.

1. Hooked fruit:

- i) The surface of fruits and seeds have hooks and spines which are attached with animal body and get dispersed.
- ii) Example: Xanthium and Aristida.

2. Sticky fruits and seeds:

- i) Some fruits have sticky glandular hairs which are attached with animal body and get dispersed.
- ii) Example: Cleome and Boerhavia.

3. Fleshy fruits:

- i) Some fleshy fruits are dispersed by animals and human beings after the consumption.
- ii) Example: Mango and Papaya.

I. One mark Answers:-

- 1.c) community → Ecosystem → Landscape → Biome
 2.d) ii and iii only
 3.b) niche
 4.d) i and ii only
 5.a) Calotropis
 6.c) i, ii and iv only
 7.b) Statement A is correct but statement B is incorrect.
 8.c) Capillary water

9.

	(i)	(ii)	(iii)
(a)	Holard	Echard	Chresard

10.

	(I)	(II)	(III)	(IV)
(c)	iii	ii	i	iv

11.d) Halophytes

12.

	A	B	C	D
(a)	(+)	Parasitism	(-)	Amensalism

- 13.c) Mimicry
 14.b) Anabaena
 15.d) Soil
 16.b) Absorbing inorganic ions from soil
 17.c) Nerium
 18.a) Nymphaea and typha

19.

	I	II	III	IV	V
(d)	iv	iii	ii	v	i

- 20.b) Ecballium
 21.b) Zoochory

Unit-IX: Plant Ecology

Chapter-7. Ecosystem

Book back Answers

I. One mark questions:-

1. Which of the following is not a abiotic component of the ecosystem?
a) Bacteria b) Humus c) Organic compounds d) Inorganic compounds
2. Which of the following is / are not a natural ecosystem?
a) Forest ecosystem b) Rice field c) Grassland ecosystem d) Desert ecosystem
3. Pond is a type of
a) forest ecosystem b) grassland ecosystem c) marine ecosystem d) fresh water ecosystem
4. Pond ecosystem is
a) not self sufficient and self regulating b) partially self sufficient and self regulating
c) self sufficient and not self regulating d) self sufficient and self regulating
5. Profundal zone is predominated by heterotrophs in a pond ecosystem, because of
a) with effective light penetration b) no effective light penetration c) complete absence of light d) a and b
6. Solar energy used by green plants for photosynthesis is only
a) 2 – 8% b) 2 – 10% c) 3 – 10% d) 2 – 9%
7. Which of the following ecosystem has the highest primary productivity?
a) Pond ecosystem b) Lake ecosystem c) Grassland ecosystem d) Forest ecosystem
8. Ecosystem consists of
a) decomposers b) producers c) consumers d) all of the above
9. Which one is in descending order of a food chain
a) Producers → Secondary consumers → Primary consumers → Tertiary consumers
b) Tertiary consumers → Primary consumers → Secondary consumers → Producers
c) Tertiary consumers → Secondary consumers → Primary consumers → Producers
d) Tertiary consumers → Producers → Primary consumers → Secondary consumers
10. Significance of food web is / are
a) it does not maintain stability in nature b) it shows patterns of energy transfer
c) it explains species interaction d) b and c
11. The following diagram represents


a) pyramid of number in a grassland ecosystem
b) pyramid of number in a pond ecosystem
c) pyramid of number in a forest ecosystem
d) pyramid of biomass in a pond ecosystem
12. Which of the following is / are not the mechanism of decomposition
a) Eluviation b) Catabolism c) Anabolism d) Fragmentation
13. Which of the following is not a sedimentary cycle
a) Nitrogen cycle b) Phosphorous cycle c) Sulphur cycle d) Calcium cycle
14. 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 iii b) ii and iv c) i and ii d) i and iv

II. Two, Three, Five Mark Questions:-

15. Productivity of profundal zone will be low. Why?

1. The deeper region of a pond below the limnetic zone is called profundal zone.
2. In this zone there is no effective sunlight. Hence, it has low productivity.

16. Discuss the gross primary productivity is more efficient than net primary productivity.

1. The total amount of food energy or biomass produced by the autotrophs is called gross primary productivity.
2. The proportion of energy which remains after the respiration is called net primary productivity.
3. $NPP = GPP - \text{Respiration}$
4. Hence, the gross primary productivity is more efficient than net primary productivity.

17. Pyramid of energy is always upright. Give reasons.

1. In the energy pyramid tropical level to producers, energy level is gradually decreasing.
2. So, energy pyramid is always upright.

18. What will happen if all producers are removed from ecosystem?

1. Plants are the primary producers of our ecosystem.
2. Without plants, nothing in this world.
3. If we removed plants from our ecosystem, it will reduce the energy level from primary to tertiary consumers.
4. Finally, all the organisms will disappear from this ecosystem.

19. Construct the food chain with the following data. Hawk, plants, frog, snake, grasshopper.

Plants → Grasshopper → Frog → Snake → Hawk.

20. Name of the food chain which is generally present in all type of ecosystem. Explain and write their significance.

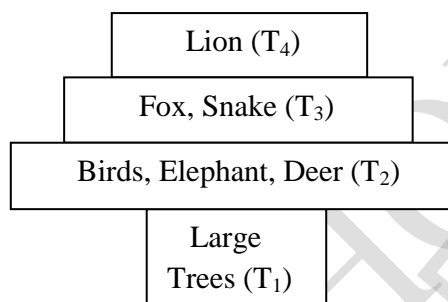
Detritus food chain present in all the type of ecosystem.

Significance of detritus food chain

1. Detritus food chain convert the dead matters into organic compounds.
2. It is a important food chain for our ecosystem.
3. Fallen leaves → Earthworm → Black bird → Hawk.
4. Detritus food chain act as a natural scavengers of our ecosystem.

21. Shape of pyramid in a particular ecosystem is always different in shape. Explain with example.

1. The forest ecosystem pyramid is different in shape.
2. The number of organisms vary from producer to tertiary level.
3. In T_1 level producers like large trees are occupied in lesser numbers.
4. In T_2 level primary consumers are occupied in large numbers.
5. In T_3 level secondary consumers are less than T_2 level.
6. In T_4 level tertiary consumers are very less than T_3 level.
7. Hence, the forest ecosystem pyramid is always in different shape.

**22. Generally human activities are against to the ecosystem, where as you a student how will you help to protect ecosystem?**

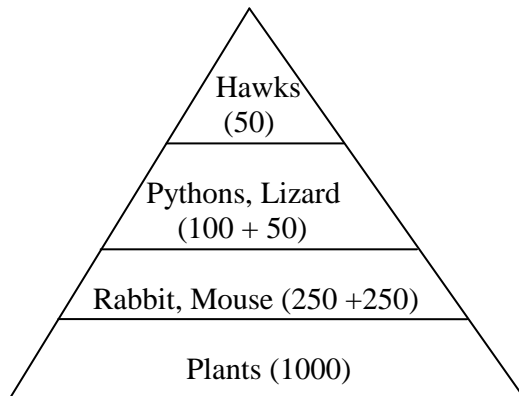
As a student I will follow the below instructions to protect our ecosystem

1. I will properly maintain the biodiversity.
2. I never use the plastic things and I never burn it.
3. I am always utilize the renewable resource for my daily life.
4. I creat the awareness about ecosystem to our society.
5. I will conduct the awareness program for sustainable agriculture to our students community.
6. I will plant more trees in my environment.

23. Generally in summer the forest are affected by natural fire. Over a period of time it recovers itself by the process of successions. Find out the types of succession and explain.

1. Destroyed and affected forest areas are recovered by the secondary succession.
2. It's starts from external factors.
3. It starts where soil covers is already present.
4. Pioneer species are developed from existing environment.
5. It take less time to complete.

24. Draw a pyramid from following details and explain in brief. Quantities of organisms are given-Hawks-50, plants-1000, rabbit and mouse-250 +250, pythons and lizard- 100 + 50 respectively.



1. The number of organisms present in each successive trophic level of ecosystem is called Number pyramid.
2. In this pyramid, gradually decreasing the number of organisms from producer to tertiary consumer level.
3. Hence, Pond and Grassland ecosystem pyramids are always upright.

25. Various stages of succession are given bellow. From that rearrange them accordingly. Find out the type of succession and explain in detail. Reed-swamp stage, phytoplankton stage, shrub stage, submerged plant stage, forest stage, submerged free floating stage, marsh meadow stage.

This succession represented Hydrosere. It includes the following stages...

1. Phytoplankton stage:

1. This is the first stage of hydrosere.
2. In this stage pioneer community organisms like green algae, blue green algae and bacteria are present.
3. This stage favors to the development of next stages.

2. Submerged plant stage:

1. This is the second stage of hydrosere.
2. In this stage rooted submerged hydrophyte plants like Hydrilla, Chara and Vallisneria are present.
3. This habitats are replaced by floating hydrophytes.

3. Submerged free floating stage:

1. This is the third stage of hydrosere.
2. The rooted hydrophytes like Trapa, Nelumbo are present.
3. Some free floating hydrophytes like Azolla, Wolffia and Pistia also present.

4. Reed-swamp stage:

1. This is the fourth stage of hydrosere.
2. Aquatic and terrestrial plants are growing in this stage. Hence, it is called as amphibious stage.
3. Typha and Sagittaria plants are present in this stage.

5. Marsh meadow stage:

1. This is the fifth stage of hydrosere.
2. In this stage Cyperus, Carex plants are present.
3. At the end of this stage, soil becomes dry.

6. Shrub stage:

1. This is the sixth stage of hydrosere.
2. In this stage terrestrial plants like Alnus and Populus are present.
3. These plants are absorbing the huge amount of water and make the habitat dry.

7. Forest stage:

1. This is the last and seventh stage of hydrosere.
2. It is the climax stage of hydrosere.
3. In this stage climax community plants like Bamboo, Tectona, and Artocarpus are present.
4. Finally, this hydrosere succession leads to the forest ecosystem.

I.One mark Answers:-

- 1.a) Bacteria
- 2.b) Rice field
- 3.d) fresh water ecosystem
- 4.d) self sufficient and self regulating
- 5.b) no effective light penetration
- 6.b) 2 – 10%
- 7.d) Forest ecosystem
- 8.d) all of the above
- 9.c) Tertiary consumers Secondary consumers Primary consumers Producers
- 10.d) b and c
- 11.c) pyramid of number in a forest ecosystem
- 12.c) Anabolism
- 13.a) Nitrogen cycle
- 14.c) i and ii

Unit-IX: Plant Ecology
Chapter-8. Environmental Issues
Book back Answers

I. One mark questions:-

1. Which of the following would most likely help to slow down the greenhouse effect?
 - a) Converting tropical forests into grazing land for cattle.
 - b) Ensuring that all excess paper packaging is buried to ashes.
 - c) Redesigning landfill dumps to allow methane to be collected.
 - d) Promoting the use of private rather than public transport.
2. With respect to *Eichhornia*

Statement A: It drains off oxygen from water and is seen growing in standing water.

Statement B: It is an indigenous species of our country.

 - a) Statement A is correct and Statement B is wrong.
 - b) Both Statements A and B are correct.
 - c) Statement A is correct and Statement B is wrong.
 - d) Both statements A and B are wrong.
3. Find the wrongly matched pair.
 - a) Endemism - Species confined to a region and not found anywhere else.
 - b) Hotspots - Western ghats
 - c) Ex-situ Conservation - Zoological parks
 - d) Sacred groves - Saintri hills of Rajasthan
 - e) Alien sp. Of India - Water hyacinth
4. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancer?
 - a) Ammonia
 - b) Methane
 - c) Nitrous oxide
 - d) Ozone
5. One green house gas contributes 14% of total global warming and another contributes 6%. These are respectively identified as
 - a) N₂O and CO₂
 - b) CFCs and N₂O
 - c) CH₄ and CO₂
 - d) CH₄ and CFCS
6. One of the chief reasons among the following for the depletion in the number of species making endangered is
 - a) over hunting and poaching
 - b) green house effect
 - c) competition and predation
 - d) habitat destruction
7. Deforestation means
 - a) growing plants and trees in an area where there is no forest
 - b) growing plants and trees in an area where the forest is removed
 - c) growing plants and trees in a pond
 - d) removal of plants and trees
8. Deforestation does not lead to
 - a) Quick nutrient cycling
 - b) soil erosion
 - c) alternation of local weather conditions
 - d) Destruction of natural habitat weather conditions
9. The unit for measuring ozone thickness
 - a) Joule
 - b) Kilos
 - c) Dobson
 - d) Watt
10. People's movement for the protection of environment in Sirsi of Karnataka is
 - a) Chipko movement
 - b) Amirtha Devi Bishwas movement
 - c) Appiko movement
 - d) None of the above
11. The plants which are grown in silivpasture system are
 - a) Sesbania and Acacia
 - b) Solenum and Crotalaria
 - c) Clitoria and Begonia
 - d) Teak and sandal

II. Two, Three, Five Mark Questions:-**12. What is ozone hole?**

1. The depletion of ozone layer over restricted area is called ozone hole.
2. This ozone shield is being damaged by CFC, SO₂, NO₂ and CO₂.

13. Give four examples of plants cultivated in commercial agroforestry.

1. Malai vembu
2. Teak
3. Kadambu
4. Eucalyptus

14. Expand CCS.

1. Carbon Capture and Storage technique is called as CCS.
2. It is a technology of capturing CO₂ and inject into underground rock in depth of 1km.
3. This technology reduce the global warming.

15. How do forests help in maintaining the climate?

1. Increase the rainfall.
2. Reduce the landslides.
3. Provide micro climate to crops.
4. Maintain the O₂ and CO₂ level in ecosystem.
5. Maintain the atmospheric temperature and relative humidity.

16. How do sacred groves help in the conservation of biodiversity?

1. It is a community protected forest.
2. This sacred groves are based on strong religious belief.
3. 448 groves were documented throughout Tamil Nadu.
4. 6 groves were taken up for floristic and faunistic studies.
5. Example: Sittannaval, Puthupet and Devadanam.
6. These sacred groves provided fodder, medicinal plants and food items for animal and human beings.

17. Which one gas is most abundant out of the four commonest greenhouse gases? Discuss the effect of this gas on the growth of plants?

1. The following four gases are called as greenhouse gases.
 1. CO₂ (60%)
 2. CH₄ (20%)
 3. CFC (14%)
 4. Other gases (6%)
2. CO₂ (60%) is the most abundant gas in our environment.

Effects of CO₂ gas on Plant growth:

1. Change the flowering season.
2. Reduce the crop productivity.
3. Water crisis and flood damage.
4. Species extinction.
5. Increase atmospheric temperature.

18. Suggest a solution to water crisis and explain its advantages.**Water crisis:**

Lack of fresh water resources to meet water demand is called water crisis.

Solutions for water crisis:

1. Rainwater harvesting is the best solution to reduce our water scarcity.
2. We need to store rainwater in Pond, lake and rainwater harvesting pits.

Advantages of Rainwater harvesting:

1. It will increase the groundwater level.
2. Reduce soil erosion.
3. Reduce flood damage.
4. Improve groundwater quality.
5. Decrease the salinity.

19. Explain afforestation with case studies.**Afforestation:**

Planting the large number of trees in a barren land is called afforestation.

Forest Man of India:

1. Jadav Molai Payeng was born in 1963. He created dense forest in a barren land. Hence, he is called as Forest man of India.

2. This Forest man converted the barren Majuli island of Brahmaputra into dense forest.

3. Now, this Majuli island became as habitat of rhinos, deers, elephants, tigers and birds.

4. For this great contribution he was called as Forest man of India by Jawahar Lal Nehru University in 2013.

5. He was honoured with Padma Shri award by Government of India in 2015.

6. He received honorary doctorate degree from Agricultural and Kaziranga University of Assam.

20. What are the effects of deforestation and benefits of agroforestry?**Effects of deforestation:**

1. Increase soil erosion and water scarcity.

2. Reduce rainfall and soil fertility.

3. Reduce O₂ level in atmosphere.

4. Increase atmospheric temperature and global warming.

5. Deforestation leads to the formation of desert.

Benefits of agroforestry:

1. Decrease soil erosion and water scarcity.

2. Increase rainfall and soil fertility.

3. Increase O₂ level in atmosphere.

4. Decrease atmospheric temperature and global warming.

5. Provide micro climate to crops.

I. One mark Answers:-

1.c) Redesigning landfill dumps to allow methane to be collected.

2.a) Statement A is correct and Statement B is wrong.

3.d) Sacred groves - Saintri hills of Rajasthan

4.d) Ozone

5.b) CFCs and N₂O

6.d) habitat destruction

7.d) removal of plants and trees

8.a) Quick nutrient cycling

9.c) Dobson

10.c) Appiko movement

11.a) Sesbania and Acacia

Unit-X: Economic Botany

Chapter-9. Plant Breeding

Book back Answers

I. One mark questions:-

- Assertion:** Genetic variation provides the raw material for selection
Reason: Genetic variations are differences in genotypes of the individuals.
a) Assertion is right and reason is wrong. b) Assertion is wrong and reason is right.
c) Both reason and assertion is right. d) Both reason and assertion is wrong.
- While studying the history of domestication of various cultivated plants _____ were recognized earlier
a) Centres of origin b) Centres of domestication c) Centres of hybrid d) Centres of variation
- Pick out the odd pair.
a) Mass selection - Morphological characters b) Purline selection - Repeated self pollination
c) Clonal selection - Sexually propagated d) Natural selection - Involves nature
- Match Column I with Column II

Column I	Column II				
i) William S. Gaud	I) Heterosis	a) i - I	ii - II	iii - III	iv - IV
ii) Shull	II) Mutation breeding	b) i - III	ii - I	iii - IV	iv - II
iii) Cotton Mather	III) Green revolution	c) i - IV	ii - II	iii - I	iv - IV
iv) Muller and Stadler	IV) Natural hybridization	d) i - II	ii - IV	iii - III	iv - I
- The quickest method of plant breeding is
a) Introduction b) Selection c) Hybridization d) Mutation breeding
- Desired improved variety of economically useful crops are raised by
a) Natural Selection b) hybridization c) mutation d) biofertilisers
- Plants having similar genotypes produced by plant breeding are called
a) clone b) haploid c) autopolyploid d) genome
- Importing better varieties and plants from outside and acclimatising them to local environment is called
a) cloning b) heterosis c) selection d) introduction
- Dwarfing gene of wheat is
a) pal 1 b) Atomita 1 c) Norin 10 d) pelita 2
- Crosses between the plants of the same variety are called
a) interspecific b) inter varietal c) intra varietal d) inter generic
- Progeny obtained as a result of repeat self pollination a cross pollinated crop to called
a) pure line b) pedigree line c) inbreed line d) heterosis
- Jaya and Ratna are the semi dwarf varieties of
a) wheat b) rice c) cowpea d) mustard
- Which one of the following are the species that are crossed to give sugarcane varieties with high sugar, high yield, thick stems and ability to grow in the sugarcane belt of North India?
a) *Saccharum robustum* and *Saccharum officinarum* b) *Saccharum barberi* and *Saccharum officinarum*
c) *Saccharum sinense* and *Saccharum officinarum* d) *Saccharum barberi* and *Saccharum robustum*
- Match column I (crop) with column II (Corresponding disease resistant variety) and select the correct option from the given codes.

Column I	Column II	I	II	III	IV
I) Cowpea	i) Himgiri	a) iv	iii	ii	i
II) Wheat	ii) Pusa komal	b) ii	i	iii	iv
III) Chilli	iii) Pusa Sadabahar	c) ii	iv	i	iii
IV) Brassica	iv) Pusa Swarnim	d) i	iii	iv	ii
- A wheat variety, Atlas 66 which has been used as a donor for improving cultivated wheat, which is rich in
a) iron b) carbohydrates c) proteins d) vitamins

16. Which one of the following crop varieties correct matches with its resistance to a disease?

Variety	Resistance to disease
a) Pusa Komal	Bacterial blight
b) Pusa Sadabahar	White rust
c) Pusa Shubhra	Chilli mosaic virus
d) Brassica	Pusa swarnim

17. Which of the following is incorrectly paired?

- a) Wheat – Himgiri b) Milch breed – Sahiwal c) Rice – Ratna d) Pusa Komal - Brassica

18. Match list I with list II

List I	List II
Biofertilizer	Organisms
i) Free living N ₂	a) <i>Aspergillus</i>
ii) Symbiotic N ₂	b) <i>Amanita</i>
iii) P Solubilizing	c) <i>Anabaena azollae</i>
iv) P Mobilizing	d) <i>Azotobactor</i>

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

II. Two, Three, Five Mark Questions:-

19. Differentiate primary introduction from secondary introduction.

Primary introduction	Secondary introduction
1. Well adapted to the new environment.	Superior variety hybridized with local variety.
2. No changes in original genotype.	It has many new characters.

20. How are microbial inoculants used to increase the soil fertility?

- Biofertilizers is also called as microbial inoculants.
- They are efficient to fix nitrogen.
- Improve the soil fertility and plant growth.
- They are more efficient than chemical fertilizers.
- They are Eco-friendly and easily decompose the phosphate and cellulose.

21. What are the different types of hybridization?

Hybridization is divided into four different types. Such as...

1. Intra-variety hybridization:

- The cross between same variety.
- Example: Self – Pollinated crops.

2. Inter-variety hybridization:

- The cross between two different varieties but in same species.
- Example: Cross – Pollinated crops.

3. Inter-specific hybridization:

- The cross between different species but in same genus.
- Example: *Gossypium hirsutum* X *Gossypium arboreum*.

4. Inter-generic hybridization:

- The cross between two different genera.
- Example: *Raphanobrassica* X *Triticale*.

22. Write the best suited types followed by plant breeders at present?

Now-a-days plant breeders are following the give breeding methods.

1. Selection 2. Introduction 3. Hybridization 4. Ploidy 5. Mutation 6. Tissue culture 7. Biotechnology.

23. Write a note on heterosis.

- G.H. Shull was the first scientist to use the term heterosis in 1912.
- F₁ hybrid is perform over its parents is called heterosis or hybrid vigour.
- Vigour refer to increase the plant growth, yield and resistance.

24. List out the new breeding techniques involved in developing new traits in plant breeding.

The following new breeding techniques are involved to develop new traits in plant breeding.

- Genetic Engineering 2. Plant tissue culture 3. Protoplasmic fusion or Somatic hybridization
- Molecular marking 5. DNA finger printing technique.

I.One mark Answers:-

- 1.b) Assertion is wrong and reason is right
- 2.a) Centres of origin
- 3.c) Clonal selection - Sexually propagated
- 4.b) i – III ii – I iii – IV iv – II
- 5.b) Selection
- 6.b) hybridization
- 7.a) clone
- 8.d) introduction
- 9.c) Norin 10
- 10.c) intra varietal
- 11.a) pure line
- 12.b) rice
- 13.b) *Saccharum barberi* and *Saccharum officinarum*
- 14.b) ii i iii iv
- 15.c) proteins
- 16.a) Pusa Komal – Bacterial blight
- 17.d) Pusa Komal - Brassica
- 18.b) i-d ii-c iii-a iv-b

Unit-X: Economic Botany
Chapter-10. Economically Useful Plants and Entrepreneurial Botany
Book back Answers

I. One mark questions:-

1. Consider the following statements and choose the right option.
 - i) Cereals are members of grass family.
 - ii) Most of the food grains come from monocotyledon.
 - a) (i) is correct and (ii) is wrong b) Both (i) and (ii) are correct
 - c) (i) is wrong and (ii) is correct d) Both (i) and (ii) are wrong
2. Assertion: Vegetables are important part of healthy eating.
 Reason: Vegetables are succulent structures of plants with pleasant aroma and flavours.
 - a) Assertion is correct, Reason is wrong b) Assertion is wrong, Reason is correct
 - c) Both are correct and reason is the correct explanation for assertion.
 - d) Both are correct and reason is not the correct explanation for assertion.
3. Groundnut is native of _____
 - a) Philippines b) India c) North America d) Brazil
4. Statement A: Coffee contains caffeine
 Statement B: Drinking coffee enhances cancer
 - a) A is correct, B is wrong b) A and B – Both are correct c) A is wrong, B is correct d) A and B – Both are wrong
5. *Tectona grandis* is coming under family
 - a) Lamiaceae b) Fabaceae c) Dipterocarpaceae d) Ebenaceae
6. *Tamarindus indica* is indigenous to
 - a) Tropical African region b) South India, Sri Lanka c) South America, Greece d) India alone
7. New world species of cotton
 - a) *Gossypium arboreum* b) *G. herbaceum* c) Both a and b d) *G. barbadense*
8. Assertion: Turmeric fights various kinds of cancer
 Reason: Curcumin is an anti-oxidant present in turmeric
 - a) Assertion is correct, Reason is wrong b) Assertion is wrong, Reason is correct
 - c) Both are correct d) Both are wrong
9. Find out the correctly matched pair.
 - a) Rubber - *Shorea robusta* b) Dye - *Lawsonia inermis* c) Timber - *Cyperus papyrus* d) Pulp - *Hevea brasiliensis*
10. Observe the following statements and pick out the right option from the following:

Statement I – Perfumes are manufactured from essential oils.
 Statement II – Essential oils are formed at different parts of the plants.

 - a) Statement I is correct b) Statement II is correct c) Both statements are correct d) Both statements are wrong
11. Observe the following statements and pick out the right option from the following:

Statement I: The drug sources of Siddha include plants, animal parts, ores and minerals.
 Statement II: Minerals are used for preparing drugs with long shelf-life.

 - a) Statement I is correct b) Statement II is correct c) Both statements are correct d) Both statements are wrong
12. The active principle trans-tetra hydro cannabinal is present in
 - a) Opium b) Curcuma c) Marijuana d) Andrographis
13. Which one of the following matches is correct?
 - a) Palmyra - Native of Brazil b) Saccharun - Abundant in Kanyakumari
 - c) Steveocide - Natural sweetener d) Palmyra sap - Fermented to give ethanol
14. The only cereal that has originated and domesticated from the New world.
 - a) *Oryza sativa* b) *Triticum aestivum* c) *Triticum durum* d) *Zea mays*

II. Two, Three, Five Mark Questions:-**15. Write the cosmetic uses of Aloe.**

1. Used as a skin tonic
2. Used for Cream, lotion, shampoo preparation
3. It is a antibacterial, antifungal, antioxidant and antiseptic.

16. What is pseudo cereal? Give an example.

- (i) The term pseudo-cereal is used to describe foods that are prepared and eaten as a whole grain (except grass Family plants)
- (ii) Example: Chenopodium quinoa.

17. Discuss which wood is better for making furniture.

1. Teak (*Tectona grandis*) is the one of the best timber in the world.
2. It possesses durability against termites and fungi.
3. This wood does not split and crack so it is a carpenter friendly wood.
4. It is used in railway wagon, bridge and ship construction work.
5. So, Teak is the best wood for furniture making.

18. A person got irritation while applying chemical dye. What would be your suggestion for alternative?

1. Chemical dyes are causes skin allergy and skin diseases.
2. Henna is a natural dye extracted from *Lawsonia inermis* (மருதாணி)
3. It is harmless and no irritation to the skin. So, It is a good alternate source for chemical dyes.

19. Name the humors that are responsible for the health of human beings.

The following three humors are responsible for the health of human beings. Such as..

1. Vatham (வாதம்)
2. Pittam (பித்தம்)
3. Kapam (கபம்).

20. Give definitions for organic farming?

1. The main concept of the organic farming is Back to the Nature.
2. It is an alternative agricultural system in which plants and crops are cultivated in natural ways.
3. By using biological inputs to maintain the soil fertility.

21. Which is called as the “King of Bitters”? Mention their medicinal importance.

1. Nilavembu (நிலவேம்பு) is called as The King of Bitters (*Andrographis paniculata*).
2. It is used to treat liver disorders
3. It is effectively used to treat malaria and dengue fever.

22. Differentiate bio-medicines and botanical medicines.**Bio-Medicines:**

Medicinally useful molecules obtained from plants that are marketed as drugs are called Biomedicines.

Botanical Medicines:

Medicinal plants which are marketed as powders or in other modified forms are known as Botanical medicines.

23. Write the origin and area of cultivation of green gram and red gram.

Common Name	Botanical Name	Origin	Area of Cultivation	Uses
1. Red gram or Pigeon Pea (குவரை)	<i>Cajanus cajan</i>	South India	Andhra, Karnataka, Maharashtra	1. Used in Sambar Preparation. 2. Used as a Snacks
2. Green Gram (பாசிப்பருப்பு)	<i>Vigna radiata</i>	India	Tamil Nadu, Karnataka, Madhya Pradesh	1. Used in Pongal Preparation. 2. Used as a Snacks 3. Used as a Cosmetics

24. What are Millets? What are its types? Give example for each type.

1. It is a variety of very small seeds originally cultivated by ancient peoples of Africa and Asia.
2. Types and examples of Millets: Finger Millet - Ragi, Foxtail Millet - Thinai, Kodo Millet - Varagu.

25. If a person drinks a cup of coffee daily it will help him for his health. Is this correct?

If it is correct, list out the benefits.

- Yes, it is correct. Caffeine enhances release of acetylcholine in brain. Which in turn enhances efficiency.
- It may reduce the risk of liver diseases, cancer and type 2 diabetes.

So, drinking a cup of coffee in our daily life it will be helpful for our health.

26. Enumerate the uses of turmeric.

- Turmeric is used in colouring agent in food industry and pharmacy.
- It is important constituent of curry powders.
- It is also used for dyeing leather, fibre, paper and toys.
- Curcumin is extracted from turmeric. It is an anti-bacterial, anti-fungal and anti-viral medicine.
- It is a very good anti-oxidant which helps to fight various kinds of cancer.

27. What is TSM? How is it classified and what does it focus on?

Meaning of TSM:

TSM means Traditional system of Medicines. India has a rich medicinal heritage.

Classification of TSM:

In India TSM is classified into two types such as...

- Institutionalized or Documented method
- Non-institutionalized or Oral method

Focus of TSM:

The TSM focuses on healthy life style and healthy diet for maintaining good health and disease reversal.

28. Write the uses of nuts you have studied.

- Cashew nuts are commonly used in sweets and curries.
- Roasted and raw kernels are used as snacks.

29. Give an account on the role of *Jasminum* in perfuming.

- Jasmine flowers have been used since ancient times in India for worship.
- It is a fumigant as well as making perfumed hair oils, cosmetics and soaps.
- It has anti-depression qualities.
- It is popular in air freshener.
- It is used in talcum powders, shampoos and deodorants.

30. Give an account of active principle and medicinal values of any two plants you have studied.

Common Name	Botanical Name	Family	Active principle	Medicinal value
1. Keezhanelli (கீழாநெல்லி)	Phyllanthus amarus	Phyllanthaceae	Phyllanthin	1. Cure Jaundice 2. Effective against Hepatitis B virus
2. Nilavembu (King of Bitters) (நிலவேம்பு)	Andrographis paniculata	Acanthaceae	Andrographolides	1. Used to treat liver disorders 2. Used to treat malaria and dengue fever.

31. Write the economic importance of rice.

- Rice is the easily digestible and calorie rich food
- Rice is a staple food in Southern and North East India.
- Various rice products such as flaked rice (Aval), puffed rice (Pori) are used as a breakfast in India.
- Rice bran oil is used in various industries.
- Husks are used as a fuel and good source for making cattle feed and fertilizer.

32. Which TSM is widely practiced and culturally accepted in Tamil Nadu? - explain.

Siddha is the most popular, widely practiced and culturally accepted system in Tamil Nadu.

Siddha system of medicine:

- It is based on the texts written by 18 Siddhars.
- Siddha is principally based on Panchabudha (பஞ்சபூதத்தத்துவம்) philosophy.
- This system works based on Vatham, Pittam and Kapam (வாதம், பித்தம், கபம்).
- The drug sources of Siddha are Plants and Animal parts.
- 800 different herbs are used as a drug for this system.

33. What are psychoactive drugs? Add a note *Marijuana* and *Opium*.

Some of the plants alter and individual's perceptions of mind by producing hallucination are known as psychoactive drugs.

Psychoactive Drugs						
S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Opium poppy (ஓபிள்/கசகசா)	Papaver somniferum (Morphine)	Papaveraceae	South Eastern Europe	Madhya Pradesh, Uttar Pradesh	1.Pain killer 2.Used in Surgery
2.	Cannabis or Marijuana (கஞ்சாசெடி)	Cannabis sativa (Trans-tetrahydrocannabinol -THC)	Cannabiaceae	China	Madhya Pradesh, Uttar Pradesh	1.Reduce hypertension 2.Treating in Glucoma and Chemotherapy

34. What are the King and Queen of spices? Explain about them and their uses.

Spices						
S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Black Pepper (King of Spices and Black Gold of India) (கருமிளகு)	Piper nigrum	Piperaceae	Western Ghats	Kerala, Karnataka, Tamil Nadu,	1. Used in Sauces and Soup preparation 2.Pickle and Curry powder manufacturing
2.	Cardamom (Queen of Spices) (ஏலக்காய்)	Elettaria cardamomum	Zingiberaceae	Sri Lanka	Western Ghats	1.Bakery and Beverage industry 2.Mouth freshener

35. How will you prepare an organic pesticide for your home garden with the vegetables available from Your kitchen?

Preparation of organic pesticide:

Hot chilies 120 gm and Garlic/Onion 110gm

↓
Blend the Vegetables together to form a thick paste

↓
Add vegetable paste with 500 warm water

↓
Pour the solution into a glass container

↓
Leave it undisturbed for 24 hours

↓
Pour the Pesticide into spray bottle

↓
Spray the pesticide into infected plants for every 4 to 5 days

↓
After 3 to 4 treatments pest will be eliminated.

One Mark Answers:

1. b) Both (i) and (ii) are correct
2. a) Assertion is correct, Reason is wrong
3. d) Brazil
4. a) A is correct, B is wrong
5. a) Lamiaceae
6. a) Tropical African region
7. d) *G. barbadense*
8. c) Both are correct
9. b) Dye - *Lawsonia inermis*
10. c) Both statements are correct
11. c) Both statements are correct
12. c) Marijuana
13. c) Stevioloside - Natural sweetener
14. d) *Zea mays*

1. Major Cereals

S.No.	Common Name	Botanical Name	Origin	Area of Cultivation	Uses
1.	Rice or Paddy (நெல்)	<i>Oryza sativa</i>	South East Asia	China, India, Thailand	1. Flaked rice (Aval) 2. Puffed or Parched rice (Pori) 3. Rice bran oil 4. Husks
2.	Wheat (கோதுமை)	<i>Triticum aestivum</i>	Fertile Crescent Region	Punjab, Haryana, Rajasthan	1. Bakery Products 2. Parota 3. Alcoholic Beverages

2. Millets (Siru Thaniyangal)

S.No.	Common Name	Botanical Name	Origin	Uses
1.	Finger Millet – Ragi (கேழ்வரகு)	<i>Elusine coracana</i>	East Africa	1. Staple food 2. Nutrient drink 3. Fermented beverages
2.	Sorghum (சோளம்)	<i>Sorghum vulgare</i>	Africa	1. Birds, Pigs, Cattle Feed 2. Alcoholic Beverages

3. Minor Millets

S.No.	Common Name	Botanical Name	Origin	Uses
1.	Foxtail Millet (திணை)	<i>Setaria italica</i>	China	1. Strengthening of Heart 2. Improves eye sight
2.	Kodo Millet (வரகு)	<i>Paspalum scrobiculatum</i>	West Africa	1. Reduce obesity 2. Reduce Blood sugar and Blood Pressure.

4.Pulses

S.No.	Common Name	Botanical Name	Origin	Area of Cultivation	Uses
1.	Black gram (உளுந்து)	Vigna mungo	India	Karnataka, Uttar Pradesh, Chattisgarh	1.Used as a Food 2.Flour used in Indian curries
2.	Red gram or Pigeon Pea (துவரை)	Cajanus cajan	South India	Andhra, Karnataka, Maharashtra	1.Used in Sambar Preparation. 2.Used as a Snacks
3.	Green Gram (பாசிப்பருப்பு)	Vigna radiata	India	Tamil Nadu, Karnataka, Madhya Pradesh	1.Used in Pongal Preparation. 2.Used as a Snacks 3.Used as a Cosmetics

5.Vegetables

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Lady's finger or Okra (வெண்டைக்காய்)	Abelmoschus esculentus	Malvaceae	Africa	Vellore, Coimbatore, Dharmapuri	Used as a Vegetable

6.Fruits

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Mango (மாங்காய்) (National fruit of India)	Mangifera indica	Anacardiaceae	Southern Asia	Salem, Krishnagiri, Dharmapuri	1.Edible Fruit 2.Soft drink 3.Pickle

7.Nuts

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Cashew nut (முந்திரி)	Anacardium occidentale	Anacardiaceae	Brazil	Kerala, Karnataka, Tamil Nadu	1.Sweet and Currie Preparation 2.Snacks

8.Sugars

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Sugarcane (கரும்பு)	Saccharum officinarum (S.spontaneum – India)	Poaceae	New Guinea, India	All the districts except Kanyakumari and Nilgiris	1.White sugar 2.Ethanol Preparation
2.	Palmyra (பனை) (state tree of Tamil Nadu)	Borassus flabellifer	Arecaceae	Asia, Africa	Tamil Nadu	1.Palm sugar 2.Health drink 3.Toddy

9.Oil Seeds						
S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Groundnut or Peanut (வேர்க்கடலை)	Arachis hypogaea	Fabaceae	Brazil	Andhara, Gujarat, Rajasthan	1.Snacks 2.Cooking oil 3.Soap and Lubricant manufacturing
2.	Sesame or Gingelly (நல்லெண்ணெய்)	Sesamum indicum	Pedaliaceae	Africa	West Bengal, Madhya Pradesh	1.Snacks 2.Cooking oil 3.Soap and Lubricant manufacturing

10.Beverages

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Coffee (கா.பி)	Coffea arabica	Rubiaceae	Ethiopia	Karnataka, Tamil Nadu, Kerala	1.Cure liver diseases 2.Reduce the risk of type 2 diabetes

11.Spices

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Cardamom (Queen of Spices) (ஏலக்காய்)	Elettaria cardamomum	Zingiberaceae	Sri Lanka	Western Ghats	1.Bakery and Beverage industry 2.Mouth freshener
2.	Black Pepper (King of Spices and Black Gold of India) (கருமிளகு)	Piper nigrum	Piperaceae	Western Ghats	Kerala, Karnataka, Tamil Nadu,	1. Used in Sauces and Soup preparation 2.Pickle and Curry powder manufacturing
3.	Turmeric (மஞ்சள்)	Curcuma longa	Zingiberaceae	Southern Asia	Tamil Nadu (Erode)	1.Cosmetics, Curry powder manufacturing 2.Anti-fungal, Bacterial, Viral activities
4.	Chillies (Red Pepper or Cayenne Pepper) (மிளகாய்)	1.Capsicum annum (Cayenne Pepper) 2.Capsicum frutescens	Solanaceae	South America	India	1.Sauces, Curry powder manufacturing 2.Good source of Vitamin A,C,E.

12. Condiment

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Tamarind (புளி) (Dates of India)	Tamarindus indica	Fabaceae	Tropical Africa	India, Myanmar	1.Sauces, Curry powder manufacturing 2.Edible fruit

13. Fibres

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Cotton (பருத்தி)	Gossypium spp.	Malvaceae	Old world, New world	Tamil Nadu, Andhra, Maharashtra	1.Textile fibre 2.Used in Hospitals
2.	Jute (சணல்)	Corchorus spp	Malvaceae	Africa	India, Bangladesh	1.Textile fibre 2. Used in sacks and bag manufacturing

14. Timber

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Teak (தேக்கு)	Tectona grandis	Lamiaceae	South East Asia	Kerala, Assam, Tamil Nadu	1.Timber 2.Used in Door, Ship, Boat, Toy's manufacturing

15. Latex

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Rubber (இரப்பர்)	Hevea brasiliensis	Euphorbiaceae	Brazil	Kerala, Tamil Nadu	1.Eraser, Belt, Rubber-band manufacturing 2.Tyre and Footwear Production.

16. Pulp Wood

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Pulp (மரக்கூழ்) (Melia azadirachta, Neolamarkia chinensis, Casuarina spp, Eucalyptus spp)	Cyperus papyrus	Cyperaceae	Egypt	China (Discovered the Paper)	Paper and Cardboard manufacturing

17.Dyes

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Henna (மருதாணி)	Lawsonia inermis	Lythraceae	North Africa, South West Asia	Gujarat, Rajasthan, Madya Pradesh	1.Colouring material 2.Dye used for skin, hair, nail colouring.

18.Cosmetics

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Aloe (சோற்றுக்கற்றாழை)	Aloe vera	Asphodelaceae	Sudan	Tamil Nadu, Andhra, Gujarat, Rajasthan	1.Skin tonic 2.Cream, lotion, shampoo preparation

19.Perfumes

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Jasmine (மல்லிகை)	Jasminum grandiflorum	Oleaceae	North-Western Himalayas	Madurai, Thovalai (Kanyakumari district)	1.Fumigant 2.Hair oil, cosmetics, and soap manufacturing

20.Medicinal Plants

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Keezhanelli (கீழாநெல்லி)	Phyllanthus amarus (Phyllanthin)	Phyllanthaceae	Tropical America	India	1.Cure Jaundice 2.Effective against Hepatitis B virus
2.	Nilavembu (King of Bitters) (நிலவேம்பு)	Andrographis paniculata (Andrographolides)	Acanthaceae	India, Sri Lanka	India	1.Used to treat liver disorders 2.Used to treat malaria and dengue fever.

21.Psychoactive Drugs

S.No.	Common Name	Botanical Name	Family	Origin	Area of Cultivation	Uses
1.	Opium poppy (ஓபிபின்/கசகசா)	Papaver somniferum (Morphine)	Papaveraceae	South Eastern Europe	Madhya Pradesh, Uttar Pradesh	1.Pain killer 2.Used in Surgery
2.	Cannabis or Marijuana (கஞ்சாசெடி)	Cannabis sativa (Trans-tetrahydrocannabinol -THC)	Cannabiaceae	China	Madhya Pradesh, Uttar Pradesh	1.Reduce hypertension 2.Treating in Glucoma and Chemotherapy

22. Other Common Medicinal Plants

S.No.	Common Name	Botanical Name	Family	Plant part used	Uses
1.	Holy basil (குளசி)	Ocimum tenuiflorum	Lamiaceae	Leaves, Root	1.Antiseptic 2.Used in bronchitis 3.Used in Malarial fever
2.	Indian goosberry (நெல்லி)	Phyllanthus emblica	Phyllanthaceae	Fruit	1.Reduce fever and cough 2.Anti-aging properties 3.Rejuvenator
3.	Indian Acalypha (குப்பைமேனி)	Acalypha indica	Euphorbiaceae	Leaves	1.Cure skin diseases 2.Cure infected wounds and bedsores
4.	Vilvam (வில்வம்)	Aegle marmelos	Rutaceae	Fruit	1.Kill intestinal Parasites 2.unripe fruit used to treat stomach indigestion
5.	Veldt grape (பிரண்டை)	Cissus quadrangularis	Vitaceae	Stem, Root	1.Used to treat Bone fracture 2.Cure asthma and stomach trouble

Additional questions:**1.Ayurveda system of medicine:**

- 1.Ayurveda supposed to have originated from Brahma (பிரம்மா).
- 2.It is documented by Charaka, Sushruta, Vagbhata.
- 3.This system also working based on Vata, Pitta and Kapha (வாதம்,பித்தம்,கபம்).
- 4.This system uses more herbs and few animal parts as a drug.
- 5.Himalayan plants are used as a plant source and 500 different herbs are used as a drug for this system.

2.Folk system of medicine:

- 1.It is a oral traditional system of Medicine.
- 2.It is practiced by Rural and Tribal people of India.
- 3.This system is used by ethnic communities. 8000 Plant species have been documented.
- 4.The drug plants are documented by Research project on Ethnobiology.
- 5.Irulas, Malayalis, Kurumbas, Paliyans and Kaanis these tribal communities of Tamil Nadu practiced folk system of medicine.

3.Entrepreneurial Botany:

- 1.Entrepreneurial Botany is a study of how new businesses are created using plant resources.
- 2.Entrepreneurship is now a popular topic for higher secondary students.
- 3.Vast opportunities are there for the Botany students.
- 4.Converting Botanical knowledge into a business idea.
- 5.Mushroom cultivation, Single cell protein (SCP), Organic farming, Medicinal and aromatic plant cultivation are the few examples of entrepreneurship.

4. Organic farming:

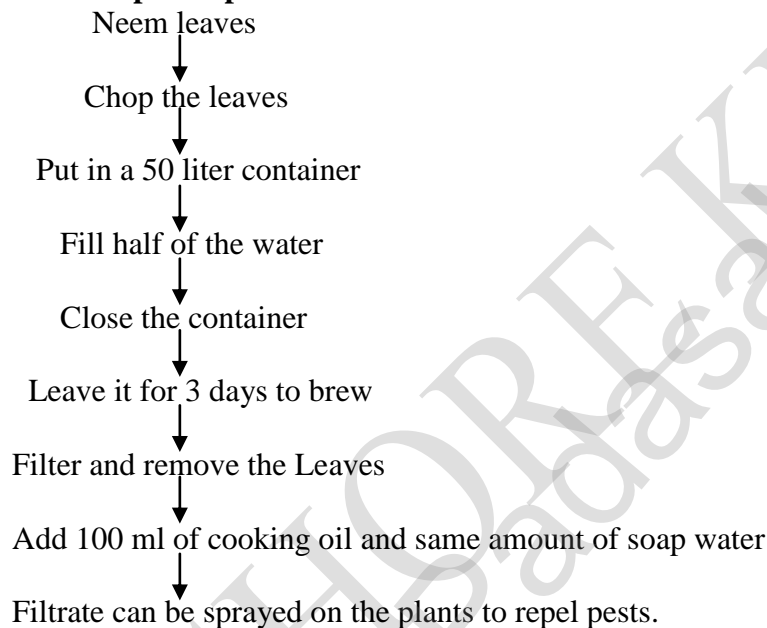
- 1.The main concept of the organic farming is Back to the Nature.
- 2.It is an alternative agricultural system in which plants and crops are cultivated in natural ways by using biological inputs to maintain the soil fertility.
- 3.Before green revolution Indian farmers are practiced organic farming.
- 4.orgainc farming is the good source for the sustainable agriculture.
- 5.Biofertilizers and micro-organisms are used for organic farming.

I.Organic Pesticide:

- 1.Pest like aphids, spider and mites can cause serious damage to flowers, fruits and vegetables.
- 2.These creatures attack the garden in swarms and drain the life of the crop.
- 3.Many chemical pesticides prove unsafe for human and the environment.
- 4.It turns fruits and vegetables are unsafe for consumption.
- 5.There are many homemade, organic options to turn to war against pests.

II.Bio-pest repellent:

Pest repellent and insecticides are made form leaves of Azadirachta indica (Neem-வேம்பு)

Preparation of Bio-pest repellent:

Lesson 10. Plants Common name, Botanical name and Family			
S.No.	Common Name	Botanical Name	Family
1.	Rice or Paddy	<i>Oryza sativa</i>	Poaceae
2.	Wheat	<i>Triticum aestivum</i>	Poaceae
3.	Finger Millet – Ragi	<i>Elusine coracana</i>	Poaceae
4.	Sorghum	<i>Sorghum vulgare</i>	Poaceae
5.	Foxtail Millet	<i>Setaria italica</i>	Poaceae
6.	Kodo Millet	<i>Paspalum scrobiculatum</i>	Poaceae
7.	Sugarcane	<i>Saccharum officinarum</i> <i>Saccharum spontaneum</i>	Poaceae
8.	Black gram	<i>Vigna mungo</i>	Fabaceae
9.	Red gram or Pigeon Pea	<i>Cajanus cajan</i>	Fabaceae
10.	Green Gram	<i>Vigna radiata</i>	Fabaceae
11.	Groundnut or Peanut	<i>Arachis hypogaea</i>	Fabaceae
12.	Tamarind	<i>Tamarindus indica</i>	Fabaceae
13.	Lady's finger or Okra	<i>Abelmoschus esculentus</i>	Malvaceae
14.	Cotton	<i>Gossypium</i> spp.	Malvaceae
15.	Jute	<i>Corchorus</i> spp.	Malvaceae
16.	Rubber	<i>Hevea brasiliensis</i>	Euphorbiaceae
17.	Keezhanelli	<i>Phyllanthus amarus</i>	Euphorbiaceae
18.	Indian Acalypha	<i>Acalypha indica</i>	Euphorbiaceae
19.	Mango	<i>Mangifera indica</i>	Anacardiaceae
20.	Cashew nut	<i>Anacardium occidentale</i>	Anacardiaceae
21.	Cardamom	<i>Elettaria cardamomum</i>	Zingiberaceae
22.	Turmeric	<i>Curcuma longa</i>	Zingiberaceae
23.	Teak	<i>Tectona grandis</i>	Lamiaceae
24.	Holy basil	<i>Ocimum tenuiflorum</i>	Lamiaceae
25.	Chilly	<i>Capsicum annum</i> <i>Capsicum frutescens</i>	Solanaceae
26.	Palmyra	<i>Borassus flabellifer</i>	Arecaceae
27.	Sesame or Gingelly	<i>Sesamum indicum</i>	Pedaliaceae
28.	Coffee	<i>Coffea arabica</i>	Rubiaceae
29.	Black Pepper	<i>Piper nigrum</i>	Piperaceae
30.	Pulp	<i>Cyperus papyrus</i>	Cyperaceae
31.	Indian lilac	<i>Melia azadirachta</i>	Meliaceae
32.	Henna	<i>Lawsonia inermis</i>	Lythraceae
33.	Aloe	<i>Aloe vera</i>	Asphodelaceae
34.	Jasmine	<i>Jasminum grandiflorum</i>	Oleaceae
35.	Nilavembu	<i>Andrographis paniculata</i>	Acanthaceae
36.	Opium poppy	<i>Papaver somniferum</i>	Papaveraceae
37.	Cannabis or Marijuana	<i>Cannabis sativa</i>	Cannabiaceae
38.	Indian goosberry	<i>Phyllanthus emblica</i>	Phyllanthaceae
39.	Vilvam	<i>Aegle marmelos</i>	Rutaceae
40.	Veldt grape	<i>Cissus quadrangularis</i>	Vitaceae

பாடம்:10. தாவரங்களின் இருசொற் பெயர்களும், குடும்பப் பெயர்களும்			
வ.எண்	பொதுப் பெயர்	தாவரவியல் பெயர்	குடும்பம்
1.	நெல்	ஓரைசா சட்டைவா	போயேசி
2.	கோதுமை	டிரிட்டிகம் ஏஸ்டிவம்	போயேசி
3.	கேழ்வரகு	எல்லுசின் கோரக்கானா	போயேசி
4.	சோளம்	சொர்கம் வல்கேர்	போயேசி
5.	தினை	சிட்டேரியா இடாலிக்கா	போயேசி
6.	வரகு	பஸ்பாலம் ஸ்குரோபிகுலேட்டம்	போயேசி
7.	கரும்பு	சக்காரம் அ.பிசினாரம் சக்காரம் ஸ்பான்டேனியம்	போயேசி
8.	உளுத்து	விக்னா முங்கோ	:.பேபேசி
9.	துவரை	கஜானஸ் கஜன்	:.பேபேசி
10.	பாசிப்பருப்பு	விக்னா ரேடியேட்டா	:.பேபேசி
11.	வேர்க்கடலை	அராகிஸ் ஹைபோஜியா	:.பேபேசி
12.	புளி	டாமெரிண்டஸ் இண்டிகா	:.பேபேசி
13.	வெண்டைக்காய்	எபெல்மாஸ்கஸ் எஸ்குலெண்டஸ்	மால்வேசி
14.	பருத்தி	காஸிபியம் சிற்றினம்	மால்வேசி
15.	சணல்	கார்கோரஸ் சிற்றினம்	மால்வேசி
16.	இரப்பர	ஹீவியா பிரேசிலியன்ஸிஸ்	யூ:.போர்பியேசி
17.	கீழாநெல்லி	பில்லாந்தஸ் அமாரஸ்	யூ:.போர்பியேசி
18.	குப்பைமேனி	அக்காலி.பா இண்டிகா	யூ:.போர்பியேசி
19.	மா	மாஞ்சி.பொர இண்டிகா	அனகார்டியேசி
20.	முந்திரி	அனகார்டியம் ஆக்ஸிடெண்டேல்	அனகார்டியேசி
21.	ஏலக்காய்	எலிட்டரியா கார்டோமோம்	ஜின்ஜிபெரேசி
22.	மஞ்சள்	குர்குமா லாங்கா	ஜின்ஜிபெரேசி
23.	தேக்கு	டெக்டோனா கிராண்டிஸ்	லேமியேசி
24.	துளசி	ஆசிமம் டெனுயி.புளோரம்	லேமியேசி
25.	மிளகாய்	கேப்சிகம் அன்னுவம் கேப்சிகம் :.புரூட்டிசென்ஸ்	சொலானேசி
26.	பனை	பொராசஸ் :.பிளாபெல்லி.பெர்	அரிகேசி
27.	எள்	செஸாமம் இண்டிகம்	பெடாலியேசி
28.	கா.பி	கா.பியா அராபிகா	ரூபியேசி
29.	கருமிளகு	பைப்பர் நைக்ரம்	பைப்பரேசி
30.	மரக்கூழ்	சைபெரஸ் பேப்பரைஸ்	சைபெரேசி
31.	மருதாணி	லாசோனியா இனெர்மிஸ்	லைத்ரேசி
32.	சோற்றுக்கற்றாழை	அலோ வீரா	அஸ்போடெலேசி
33.	மல்லிகை	ஜஸ்மினம் கிராண்டி.புளோரம்	ஓலியேசி
34.	நிலவேம்பு	ஆண்ட்ரோகிராபிஸ் பானிகுலேட்டா	அக்காந்தேசி
35.	அபின் (அ) கசகசா	பப்பாவர் சாம்னிபெரம்	பப்பாவரேசி
36.	கஞ்சாசெடி	கன்னாபிஸ் சட்டைவா	கன்னாபியேசி
37.	நெல்லி	:.பில்லாந்தஸ் எம்பிளிகா	:.பில்லாந்தேசி
38.	வில்வம்	ஏகில் மார்மிலாஸ்	ரூட்டேசி
39.	பிரண்டை	சிசஸ் குவாட்ராங்குலாரிஸ்	வைட்டேசி
40.	மலைவேம்பு	மீலியா அசடிர்க்டா	மீலியேசி
