UNIT X : ECONOMIC BOTANY

CHAPTER 9

PLANT BREEDING

POINTS TO REMEMBER

- Economic botany is the study of the relationship between people and economically important plants.
- The domesticated species are renewable sources that have provided food and other benefits to human.agriculture is found in the fertile crescent region in and around Tigris and Euphrates river valleys,
- Biofertilizers could be also called as microbial cultures, bioinoculants, bacterial inoculants or bacterial fertilizers.
- Rhizobium bacteria are called rhizobium bio-fertilizer culture.
- Rhizobium is best suited for the paddy fields which increase the yield by 15 – 40%.
- Azolla is a free-floating water fern that fixes the atmospheric nitrogen
- Arbuscular mycorrhizae is the symbiotic association between certain phycomycetous fungi and angiosperm roots.
- Seaweed liquid fertilizer contains cytokinin, gibberellins and auxin apart from macro and micro nutrients.
- Bio-pesticides are biologically based agents used for the control of plant pests.
- Rhizobium, Azolla, VAM and sea weeds are used as fertilizers which increase the crop yield many fold.
- One of the main objectives of the green manuring is to increase the content of nitrogen in the soil.
- Green revolution -a purposeful manipulation of plant species in order to create desired genotype and phenotype for the benefit of humans.
- Plant introduction is a introduction of genotypes from a place where it is normally grown to a new place or environment.
- Selection is the choice of certain individuals from a mixed population for a one or more desirable traits.
- Johannsen in 1903 coined the word pureline.
- The first natural hybridization was observed by Cotton Mather in maize.
- The superiority of the F1 hybrid in performance over its parents is called heterosis or hybrid vigour.
- Muller and Stadler (1927- 1928) coined the term mutation breeding.
- chromosome number is doubled by itself in the same plant, is called autopolyploidy.
- Majority of flowering plants are diploid (2n).
- Green revolution the term was coined by William S.Gaud in (1968).
- Dr. Swaminathan is called "Father of green revolution in India".
- **Nel Jayaraman** received the National Award for best Genome Savior.
- Atlas 66 having a high protein content, has been used a donor for improving cultivated wheat.
- Genetic Engineering, Plant tissue culture, Protoplasmic fusion or somatic hybridisation, Molecular marking and DNA finger printing are some of the modern plant breeding tools

PART – A

TEXTUAL QUESTIONS (1 MARK)

Book Evaluation

1. 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. **Ans.c**

2. 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 **Ans.a**

3. 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 **Ans. c**

4. Match Column I with Column II

Column I	Column II
i) William S. Gaud	I) Heterosis
ii) Shull	II) Mutation breeding
iii) Cotton Mather	III) Green revolution
iv) Muller and Stadler	IV) Natural hybridization

a) i – I, ii – II, iii – III, iv – IV

b) i – III, ii – I, iii – IV, iv – II

c) i – IV, ii – II, iii – I, iv – IV

d) i – II, ii – IV, iii – III, iv – I **Ans. b**

5. The quickest method of plant breeding is

a) Introduction b) Selection

c) Hybridization d) Mutation breeding

Ans. b

6. Desired improved variety of economically useful crops are raised by

a) Natural Selection b) hybridization

c) mutation d) biofertilisers **Ans. b**

7. Plants having similar genotypes produced by plant breeding are called

a) clone b) haploid

c) autopolyploid d) genome **Ans. a**

8. Importing better varieties and plants from outside and acclimatising them to local environment is called

a) cloning b) heterosis

c) selection d) introduction **Ans. a**

9. Dwarfing gene of wheat is

a) pal 1 b) Atomita 1

c) Norin 10 d) pelita 2 **Ans. c**

10. Crosses between the plants of the same variety are called

a) interspecific b) inter varietal

c) intra varietal d) inter generic **Ans. c**

11. 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 **Ans. c**

12. Jaya and Ratna are the semi dwarf varieties of

a) wheat b) rice

c) cowpea d) mustard **Ans. b**

13. 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*

Ans. b

14. 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. Cowpea	i. Himgiri
II. Wheat	ii. Pusa komal
III. Chilli	iii. Pusa Sadabahar
IV. Brassica	iv. Pusa Swarnim

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

Ans. b

15. 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 **Ans. c**

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

Ans. a

17. Which of the following is incorrectly paired?

a) Wheat - Himgiri

b) Milch breed - Sahiwal

c) Rice - Ratna

d) Pusa Komal - Brassica **Ans. d**

18. Match list I with list II

List I	List II
Biofertilizer	**Organisms**
i) Free living N2	a) *Aspergillus*
ii) Symbiotic N2	b) *Amanita*
iii) P Solubilizing	c) *Anabaena azollae*
iv) P Mobilizing	d) *Azotobactor*

a. ic, iia, iiib, ivd b. id, iic, iiia, ivb.

c. ia, iic, iiib, ivd c. ib, iia, iiid, ivc. **Ans.b**

PART – B,C AND D

TEXTUAL QUESTIONS (2,3 AND 5 MARKS)

19. Differentiate primary introduction from secondary introduction.

Primary introduction	Secondary introduction
The introduced variety is well adapted to the new environment without any alternation to the original genotype	The introduced variety is subjected to selection to isolate a superior variety.

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

- Microbial innoculants also called biofertilizers.
- Biofertilizers are defined as preparations containing living cells of efficient strains of microorganisms.
- It helps crop plants uptake of nutrients by their interactions in the rhizosphere when applied through seed or soil.
- Bio-fertilisers containing rhizobium bacteria are called rhizobium bio-fertilizer culture.
- Symbiotic bacteria that reside inside the root nodules.
- It convert the atmospheric nitrogen into a bio available form to the plants.
- This nitrogen fixing bacterium applied it multiplies and fixes the atmospheric nitrogen in the soil.
- Rhizobium is best suited for the increase the soil fertility in paddy fields.
- So it increases the yield by 15 – 40%.

21. What are the different types of hybridization?

The different types of Hybridization are

i. **Intravarietal hybridization**

The cross made between the plants of same variety is called intravarietal hybridization.

This crosses are useful only in the self-pollinated crops.

ii. **Intervarietal hybridization**

The cross made between two different varieties of the same species is called intraspecific hybridization.

This improving self-pollinated and cross pollinated crops

iii. **Interspecific hybridization**

The cross made between two different species belongs to the same genus is called intragenic hybridization.

It is commonly used for transferring the genes of disease, insect, pest and drought resistance from one species to another.

Example: *Gossypium hirsutum* x *Gossypium arboreum* – Deviraj.

iv. Intergeneric hybridization

The crosses are made between the plants belonging to two different genera is called intergeneric hybridization. **Disadvantages**

Hybrid sterility, time consuming and expensive procedure.

Example: Raphanobrassica, Triticale.

22. Explain the best suited type followed by plant breeders at present?

The best suited type followed by plant breeders at present is hybridization

Steps involved in hybridization are as follows.

1. Selection of Parents 2. Emasculation 3. Bagging 4. Crossing 5. Harvesting seeds and raising plants

1. **Selection of Parents**

Male and female plants of the desired characters are selected.

It should be tested for their homozygosity.

2. **Emasculation**

The removal of anthers to prevent self pollination before anthesis is called emasculation**.**

3. **Bagging**

The stigma of the flower is protected against any undesirable pollen grains, by covering it with a bag.

4. **Crossing**

Transfer of pollen grains from selected male flower to the stigma of the female emasculated flower.

5. **Harvesting seeds and raising plants**

The pollination leads to fertilization and finally seed formation takes place.

The seeds are grown into new generation which are called hybrid.

23. Write a note on heterosis.

G.H. Shull first to use the term heterosis (1912).

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

Vigour refers to increase in growth, yield, greater adaptability of resistance to diseases, pest and drought.

Depending on the nature, origin, adaptability and reproducing ability heterosis can be classified as:

i. Euheterosis- This is the true heterosis which is inherited

a. Mutational Euheterosis

Simplest type of euheterosis.

It results from the sheltering or eliminating of the deleterious, unfavourable often lethal, recessive, mutant genes by their adaptively superior dominant alleles in cross pollinated crops.

b. Balanced Euheterosis

Well balanced gene combinations which is more adaptive to environmental conditions and agricultural usefulness.

ii. Psuedoheterosis

Also termed as luxuriance.

Progeny possess superiority over parents in vegetative growth but not in yield and adaptation

These usually sterile or poorly fertile.

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

- New breeding techniques (NBT) are a collection of methods that could increase and accelerate the development of new traits in plant breeding.
- These techniques often involve genome editing, to modify DNA at specific locations within the plants to produce new traits in crop plants.

The various methods of achieving these changes in traits include the following.

- Cutting and modifying the genome during the repair process by tools like CRISPR /Cas.
- Genome editing to introduce changes in few base pairs using a technique called Oligonucleotide-directed mutagenesis (ODM).
- Transferring a gene from an identical or closely related species called cisgenesis.
- Organising processes that alter gene activity without altering the DNA itself(epigenetic methods).

PART – A

ADDITIONAL QUESTIONS (1 MARK)

1. Who developed world's first cotton hybrid

a) Sir.T.S.Venkataraman b) N.G.P.Rao
c) Dr.B.P.Pal d) C.T.Patel **Ans. d**

2. Who is the pioneer of mutation breeder

a) Dr. M. S. Swaminathan
b) N.G.P.Rao
c) Dr.B.P.Pal
d) C.T.Patel **Ans. a**

3. Who is an eminent sugarcane breeder

a) Sir.T.S.Venkataraman b) N.G.P.Rao
c) Dr.B.P.Pal d) C.T.Patel **Ans. a**

4. Who is an eminent rice breeder, developed several high yielding varieties of rice

a) Sir.T.S.Venkataraman b) N.G.P.Rao
c) Dr. K. Ramiah d) C.T.Patel **Ans. c**

5. Who is the famous wheat breeder, developed superior disease resistant varieties of wheat

a) Sir.T.S.Venkataraman b) Dr.B.P.Pal
c) Dr. K. Ramiah d) C.T.Patel **Ans. b**

6. who is famous for C-591 variety of wheat

a) Sir.T.S.Venkataraman b) Dr.B.P.Pal
c) Choudhary Ram Dhand) C.T.Patel **Ans. c**

7. The new varieties of plants are produced by

a) introduction and mutation
b) selection and hybridization
c) selection and intro
d) mutation and selection **Ans: b**

8. India's wheat yield revolution in the 1960s was possible primarily due to

a) mutations resulting in plant height reduction
b) hybrid seeds
c) quantitative trait mutations
d) increased chlorophyll content **Ans: a**

9. Which of the following plants are used as green manure in crop fields and in sandy soils?

a) Calotropis procera and Phyllanthus niruri
b) Dichanthium annulatum and Azolla nilotica
c) Saccharum munja and Lantana camara
d) Crotalaria juncea and Alhagi camelorum

Ans: d

10. In maize, hybrid vigour is exploited by

a) inducing mutations
b) crossing of two inbred parental lines
c) bombarding the protoplast with DNA
d) harvesting seeds from the most productive plants

Ans: b

11. Triticale, the first man-made cereal crop, has been obtained by crossing wheat with

a) barley b) pearl millet
c) rye d) sugarcane **Ans: c**

12. In maize, hybrid vigour is exploited by

a) inducing mutations
b) crossing of two inbred parental lines
c) bombarding the seeds with DNA.
d) harvesting seeds from the most productive plants **Ans: b**

13. Jaya and Ratna developed for green revolution in India are the varieties of

a) wheat b) maize
c) bajra d) rice **Ans: d**

14. Breeding of crops with high levels of minerals, vitamins and proteins is called

a) Biomagnification b) Somatic hybridisation
c) Micropropagation d) Biofortification

Ans: d

15. Green revolution in India occurred during

a) 1980.s b) 1960.s
c) 1950.s d) 1970.s **Ans: b**

16. A nitrogen-fixing microbe associated with Azolla in rice fields is:

a) Frankia b) Spirulina
c) Tolypothrix d) Anabaena **Ans: d**

17. In plant breeding programmes, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called:

a) germplasm collection
b) cross-hybridisation among the selected parents.
c) selection of superior recombinants.
d) evaluation and selection of parents. **Ans: a**

18. Three crops that contribute maximum to global food grain production are

a) Wheat, maize and sorghum
b) Wheat, rice and maize
c) Rice, maize and sorghum
d) Wheat, rice and barley **Ans: b**

19. Vavilov's centre of pine apple is

a) Chinna b) India
c) South America d) Ethiopia **Ans: c**

20. Bio-Fertilizer are also called

a) Bacterial Fertilizer b) Bacterial inoculants
c) Bio inoculants d) all of these **Ans: d**

21. P Mobilizing bio fertilizers belongs to the group of

a) Bacteria b) Ecto mycorrhiza
c) Fungi d) Symbiotic **Ans: b**

22. *Clostridium* is a

a) Free-living N_2 fixing bio fertilizer
b) P Solubilizing bio fertilizer
c) P Mobilizing bio fertilizer
d) Bio- Fertilizer for Micro Nutrients **Ans: a**

23. *Azolla* is a

a) Submerged water Fern
b) Free floating water Fern
c) Plant growth promoting rhizobacteria
d) None of these **Ans: b**

24. Bio-Pesticides are

a) Non-toxic b) Eco-friendly
c) Cheaper d) All of these **Ans: d**

25. Read the following statement

i. **Liquid sea weed fertilizer is not only organic but also eco friendly**
ii. ***Trichoderma* species is free living bacteria**
iii. ***Beauveria* species is an entomo-pathogenic fungus**
iv. **Wheat varieties of Sonora 63, Sonora 64 from South America**

a) i and ii only correct b) i and iii only correct
c) i and iv only correct d) ii and iv only correct
Ans: b

26. Rice variety of IR 8 introduced from

a) Mexico b) India
c) Philippines d) South America **Ans: c**

27. Sonora 63 and Sonora 64 is a variety of

a) Rice b) Wheat
c) Maize d) None of these **Ans: b**

28. Tea varieties are collected from

a) China b) North east India
c) Both a and b d) None of these **Ans: a**

29. The Oldest and basic method of plant breeding is

a) Selection b) Introduction
c) Hybridization d) Mutation **Ans: a**

30. National Bureau of Plant Genetic resources NBPGR located at

a) New Delhi b) Mumbai
c) Kolkata d) Chennai **Ans: a**

31. Who coin the term pure line selection

a) B.P.Pal b) Johanson
c) N.G.P. Rao d) C.T. Patel **Ans: b**

32. The Process of removal of authors an called

a) Emasculation b) Bagging
c) Crossing d) Harvesting **Ans: a**

33. The crosses are made between the plants belonging to two different genera are called

a) Intra varietal hybridization
b) Inter varietal hybridization
c) Inter specific hybridization
d) Inter genetic hybridization **Ans: d**

34. *Gossypium hirsutism* and *Gossypium arboreum*-this type of cross is

a) Intra varietal hybridization
b) Inter varietal hybridization
c) Inter specific hybridization
d) Inter genetic hybridization **Ans: c**

35. The term Heterosis was first used by

a) Johanson b) G.H. Shull
c) B.P.Pal d) C.T.Patel **Ans: b**

36. In plant breeding programmes, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called

a) Cross-Hybridization among the selected parents
b) Evaluation and selection of parents
c) Germplasm Collection
d) Selection of Superior recombinants **Ans: c**

37. The first natural hybridization was observed in

a) Maize b) Chilli
c) Wheat d) Rice **Ans: a**

38. Norin-10 dwarf wheat variety is developed by

a) Mexico's International wheat and maize improvement centre
b) Indian National Botanical Research Institute
c) Australian Crop improvement Centre
d) African Crop improvement Centre **Ans: a**

39. Emasculation is concerned with

a) Hybridisation b) Clonal selection
c) Mass selection d) Pure line selection
Ans: a

40. Cross between unrelated group of organisms is called

a) Hybrid b) Test Cress
c) Back Cross d) Heterosis **Ans: a**

41. Dwarf Wheat was developed by

a) MS. Swaminathan b) Vavilov
c) NE. Borloug d) BD. Singh **Ans: c**

42. Objective of Plant breeding is

a) Better field b) Better quality
c) Disease résistance d) All of the above
Ans: d

43. Who coined the term mutation breeding

a) Johanson b) Muller and Stadlen
c) G.H. Shull d) Cotton Mather **Ans: b**

44. The first natural hybridization was absented in maize by

a) Johanson b) Muller and Stadlen
c) G.H. Shull d) Cotton Mather **Ans: d**

45. The term green revolution was coin by

a) Johanson b) William.S. Gaud
c) G.H. Shull d) Cotton Mather **Ans: b**

46. The Indian Agricultural research institute is located in

a) New Delhi b) Calcutta
c) Odisha d) Bhopal **Ans: a**

47. The another name for hybrid vigour is

a) Heterosis b) Hybridisation
c) Mutation d) Male Sterility **Ans: a**

48. An example for semi dwarf variety of rice is

a) Sonalika b) Jaya
c) Sonora d) Lermaroja **Ans: b**

49. Himigiri is a disease resistance against stripe rust of

a) Chilli b) Maize
c) Rice d) Wheat **Ans: d**

Assertion and Reason

a) If both assertion and reason are true and Reason is Correct explanation of Assertion
b) If both Assertion and Reason are true but Reason is with the correct explanation of Assertion
c) If Assertion is true, but the reason is false
d) Both Assertion and Reason are False

50. Assertion: Hybrid vigour is Superior over either of its parents

Reason: Hybrid vigour is lost on inbreeding

Ans: b

51. Assertion: The removal of androecium from bisexual Flower is called emasculation

Reason: Emasculation is easy in care of large size Flowers **Ans: b**

52. Assertion: Hybridisation is involved in the production of hybrid vigour or heterosis

Reason: Hybrid is obtained by crossing the selected inbreed lines **Ans: b**

53. Assertion: Mass selection is useful in self pollinated plants

Reason: Self-Pollinated plants are homozygous which retain the selected traits in the progeny **Ans: a**

54. The name of Dr.NE, Borlong is associated with

a) Green revolution b) Semi-dwarf Varieties
c) Quarantine d) Gerenplasm **Ans: b**

55. The Rice with saline tolerance and pest resistance is

a) Sonora b) Atomita-2
c) Roja d) Norin **Ans: b**

56. The radioactive source of Gama garden is

a) Cobalt-62 b) Caesium-137
c) Carbon-52 d) Caesium-140 **Ans: b**

57. The example of triploid condition of auto poly policy is

a) Sugar beets b) Apple
c) Pear d) All of these **Ans: d**

58. Triticale is obtained by crossing wheat with

a) Oat b) Maize
c) Barly d) Rice **Ans: d**

59. *Tritium durum x Secale cereale* is an example for

a) Polyploidy b) Allo Polyploidy
c) Auto Polyploidy d) None of these **Ans: b**

60. MS. Swaminathan Produced the first Semi-dwarf fertilizer responsive hybrid variety of rice is

a) Norin 10 b) Taichung Native I
c) Kalyansona d) Sonara 64 **Ans: b**

61. Bagging is done to

a) Achieve desired Pollination
b) Prevent contamination of unwanted Pollen
c) Avoid self-Pollination
d) Avoid cross pollination **Ans: b**

62. A Method of selection particularly useful for self pollinated plants is

a) At random selection b) Pure line Selection
c) Mass selection d) None of these **Ans: c**

63. Polyploidy is induced through

a) Colchicine b) Irradiation
c) Mutagenic Chemicals d) Ethylene **Ans: a**

64. Cryopreservation refers

a) Breeding with wild varieties
b) Tissue culture
c) Low temperature treatment
d) Reduction in Moisture **Ans: c**

65. The three topmost major crops of the world in the order of total production are

a) Wheat > Rice > Maize
b) Rice > Wheat > Maize
c) Wheat > Maize > Rice
d) Rice > Maize > Wheat **Ans: a**

66. Hybrid vigour is mainly due to

a) Heterozygosity
b) Superiority of all the genes
c) Homozygosity
d) Making up of Cytoplasm **Ans: a**

67. The Wheat variety developed by plant breeding having high Protein content is

a) Atlas 66 b) Triticum aestivium
c) Triticum Vulgare d) None of these **Ans: a**

68. The Hybrid variety

a) Sterite b) Fertile
c) F1 Generation d) Parental generation
Ans: c

70. In Which Crops is the method of mass selection applied

a) Cross pollination b) Self Pollination

c) Both (a) and (b) d) Potato and Sugarcane

Ans: c

PART – B

ADDITIONAL QUESTIONS (2 MARKS)

1. Define economic botany

Economic botany is the study of the relationship between people and economically important plants.

2. Name the fields intersects with Economic botany

Economic botany intersects many fields .They are agronomy, anthropology, archaeology, chemistry, trade and commerce.

3. Alexander Von Humboldt (1807) contribution to agriculture.

He considered the original sources of most useful plants and their origin is an impenetrable secret.

4. Describe Darwin's evolutionary theory (1868) to agriculture

He proposed that origin of useful cultivated plants have existed through natural selection and hybridisation.

5. Write the De Candolle (1883) contribution to agriculture

in his "Origin of cultivated plants" studied 247 cultivated plant species and attempted to solve the mystery about the ancestral form, region of domestication and history.

6. Describe the origin of agriculture

Agriculture is found in the fertile crescent region in and around Tigris and Euphrates river valleys, approximately about 12,000 years ago.

7. Describe scientific foundation in understanding origin and domestication of cultivated plants

The earlier Greek and Roman naturalists like Theophrastus, Dioscorides, Pliny the elder and Galen laid down the scientific foundation in understanding origin and domestication of cultivated plants.

8. Mention Zhukovsky (1968) concepts of gene centres

He put forward the concept of mega gene centre for the origin of cultivated plants.

He divided the whole world into 12 mega gene centres.

9. Name the domesticated crops of chinna

Foxtail millet, soybean, bamboo, onion and crucifers.

10. Name the domesticated crops of India

Rice, sugarcane, mango, orange, eggplant and sesame

11. Name the domesticated crops of South East Asia

Rice, banana, coconut, clove and hemp.

12. Name the domesticated crops of Central East

Wheat, pea, hemp, cotton etc.

13. Name the domesticated crops of Mediterranean

Olive, vegetables, oil yielding plants and wheat

14. Name the domesticated crops of Ethiopia (Abyssinian)

Wheat, barley, sesame, castor and coffee.

15. Name the domesticated crops of Mesoamerica (South Mexican & Central American Centre)

Maize, bean, sweet potato, papaya, guava and tobacco.

16. Name the domesticated crops of South America

Tomato and pine-apple

17. Name the domesticated crops of the Brazilian Paraguayan Centre

Groundnut, cashew nut, pine apple, peppers and rubber

18. Define biofertilizers. Write their uses.

Biofertilizers are defined as preparations containing living cells of efficient strains of microorganisms.

It helps crop plants uptake of nutrients by their interactions in the rhizosphere when applied through seed or soil.

19. Mention the other names of biofertilizers

The other names of biofertilizers are microbial cultures, bio inoculants, bacterial inoculants or bacterial fertilizers.

20. Mention some of the P solubilizing biofertilizer

Bacteria: *Bacillus subtilis,Pseudomonas striata*

Fungi: *Penicillium, Aspergillus*

21. Mention some of the P mobilizing biofertilizers

Arbuscular: Mycorrhiza *Glomus, Scutellospora*, Ectomycorrhiza *Amanita.*

22. Mention some of the biofertilizer for micro nutrients

Silicate and Zinc solubilizers *Bacillus.*

23. Mention some of the plant growth promoting rhizobacteria

Pseudomonas: *Pseudomonas fluorescence*

24. Define rhizobium bio-fertilizer culture

Bio-fertilisers containing rhizobium bacteria are called rhizobium bio-fertilizer culture.

25. What is Azolla? Write their use.

- Azolla is a free-floating water fern.
- It fixes the atmospheric nitrogen in association with *Anabaena azolla* (nitrogen fixing blue green alga).

26. What is arbuscular mycorrhizae (AM) ?

The symbiotic association between certain phycomycetous fungi and angiosperm roots called Arbuscular mycorrhizae (AM)

27. Expand SLF

SLF - Seaweed Liquid Fertilizer

28. What is seaweed liquid fertilizer(SLF)?

Seaweed liquid fertilizer contains cytokinin, gibberellins and auxin apart from macro and micro nutrients.

29. Define green manuring

The growing of green manure crops and use of these crops directly in the field by ploughing is called Green manuring.

30. Name the important plant species useful for green leaf manure.

Cassia fistula, *Sesbania grandiflora, Azadirachta indica, Delonix regia, Pongamia pinnata* etc., are the plants useful for green leaf manure

31. What is meant by plant breeding ?

The science of improvement of crop varieties with higher yield, better quality, resistance to diseases and shorter durations which are suitable to particular environment are called Plant breeding

32. Define plant breeding

A purposeful manipulation of plant species in order to create desired genotype and phenotype for the benefit of humans.

33. What is plant introduction?

The introduction of genotypes from a place where it is normally grown to a new place or environment are called Plant introduction.

34. What is acclimatization?

The adjustment or adaptation of the introduced plant in the changed environment is called **acclimatization.**

35. Name some introduced varieties and their natives.

Rice variety of IR8 introduced from Philippines and

Wheat varieties of Sonora 63, Sonora 64 from Mexico.

36. What is meant by bio-pesticides ?

- Bio-pesticides are biologically based agents used for the control of plant pests.
- They are in high use due to their non-toxic, cheaper and eco-friendly.

37. What are the types of introduction ?

There are two types of introduction. They are 1. Primary introduction and 2.Secondary introduction

38. Name four regional plant quarantine stations located in india.

Amristsar, Kolkata, Mumbai and Chennai at Meenambakkam.

39. Expand NBPGR

NBPGR -**N**ational **B**ureau of **p**lant **G**enetic **R**esources

40. Describe selection

Selection is the choice of certain individuals from a mixed population for a one or more desirable traits.

Selection is the oldest and basic method..

41. Describe natural selection

This is by Darwinian principle "survival of the fittest".

It takes longer time in bringing about desired variation.

42. What is meant by hybridization?

The method of producing new crop varieties in which two or more plants of unlike genetically constitution is crossed together is called Hybridization.

43. What is meant by hybrid ?

Hybridization results, a progeny is called hybrid.

44. What is anthesis ?

The period of opening of a flower is called anthesis

45. What is emasculation ?

The removal of anthers to prevent self pollination before anthesis is called emasculation**.**

46. What is bagging ?

The stigma of the flower is protected against any undesirable pollen grains, by covering with a bag is called bagging.

47. What is crossing ?

This transfer of pollen grains from selected male flower to the stigma of the female emasculated flower is called crossing.

48. Define intravarietal hybridization

The cross made between the plants of same variety is called intravarietal hybridization.

This crosses are useful only in the self-pollinated crops.

49. Define intervarietal hybridization

The cross made between two different varieties of the same species is called intraspecific hybridization.

This improving self-pollinated and cross pollinated crops

50. Define interspecific hybridization. Give an example.

The cross made between two different species belongs to the same genus is called intragenic hybridization.

Example: *Gossypium hirsutum* x *Gossypium arboreum* – Deviraj.

51. Describe heterosis

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

Vigour refers to increase in growth, yield, greater adaptability of resistance to diseases, pest and drought.

52. What is meant by euheterosis ?

Euheterosis is the true heterosis. It is inherited

53. What is balanced euheterosis ?

The well balanced gene combinations which is more adaptive to environmental conditions and agricultural usefulness.

54. How is polyploidy is induced ?

The polyploidy can be induced by the use of colchicine to double the chromosome number.

55. What is meant by allopolyploids ?give examples

The allopolyploids are produced by multiplication of chromosome sets are derived from two different species.

Example: Triticale (Triticum durum x secale cereale) Raphanobrassica (Brassica oleraceae x Raphanus sativus).

56. What is meant by polyploids ?

The plants which possess more than two sets of chromosome are called polyploids.

57. What is meant by autopolyploidy ?

The chromosome number is doubled by itself in the same plant, is called autopolyploidy.

58. What is mutation ?

The sudden heritable changes in the genotype or phenotype of an organism is called mutation.

59. Who coined the term mutation breeding?

Muller and Stadler (1927- 1928) coined the term mutation breeding.

60. Write the advantage of mutation breeding.

The advantage is to improving the defect without losing agronomic and quality in agriculture and crop improvement.

61. Name some of the radiations that induce mutation.

The radiations that induce mutation are UV short wave, X-ray, Alpha (α), Beta (β), Gamma waves.

62. Name some of the chemicals that induce mutation.

The chemicals that induce mutation are cesium, EMS (ethyl methane sulfonate), nitromethyl, urea

63. Wht is parbharni kranti ?

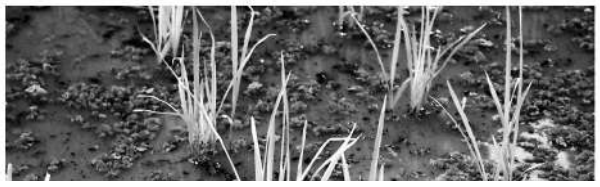
The resistance to yellow mosaic virus in bhindi (Abelmoschus escullentus) was transferred from a wild species.

It produces a new variety of A. Escullentus called Parbharni kranti.

64. What is meant by biofortification ?

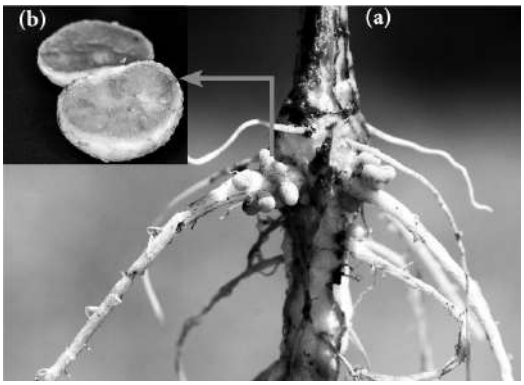
The breeding crops with higher levels of vitamins and minerals or higher protein and healthier fats is the most practical means to improve public health is called biofortification.

65. In the given representation, what does "a" strands for



a) *Azolla* in paddy field

66. In the given representation, what does "a" and "b" strands for



a) Root nodules occur on root

b) C.S. of Root nodule

PART – C

ADDITIONAL QUESTIONS (3 MARKS)

1. Write the importance of biofertilizers

- They are efficient in fixing nitrogen, solubilising phosphate and decomposing cellulose.
- They are designed to improve the soil fertility,plant growth and biological activity.
- They are eco-friendly organic agro inputs.
- They are more efficient and cost effective than chemical fertilizers.

2. Mention some of the N2 fixing biofertilize

- **Free-living:** *Azotobacter, Clostridium, Anabaena, Nostoc,*
- **Symbiotic:** *Rhizobium, Anabaena azollae*
- **Associative Symbiotic:** *Azospirillum*

3. What is an organic agriculture ?

- Thr organic farming is an alternative agricultural system.
- It is originated early in the twentieth century ..
- It is a production system that sustains the health of the soils, ecosystems and people.
- It relies on ecological processes, biodiversity, cycles adapted to local conditions and use of inputs with adverse effects.

4. Describe rhizobium bio-fertilizer culture

- The bio-fertilisers containing rhizobium bacteria are called rhizobium bio-fertilizer culture.
- The symbiotic bacteria that reside inside the root nodules.
- It convert the atmospheric nitrogen into a bio available form to the plants.
- This nitrogen fixing bacterium applied it multiplies and fixes the atmospheric nitrogen in the soil.
- The rhizobium is best suited for the paddy fields which increase the yield by 15 – 40%.

5. Describe *Azolla*

- *Azolla* is a free-floating water fern.
- It fixes the atmospheric nitrogen in association with *Anabaena azolla* (nitrogen fixing blue green alga) .
- It is used as a bio-fertilizer for wetland rice cultivation.
- It is known to contribute 40 – 60 kg/ha/crop.
- *Azolla* increasing the yield of rice crop.

6. Describe arbuscular mycorrhizae

- The symbiotic association between certain phycomycetous fungi and angiosperm roots.
- They have the ability to dissolve the phosphates found in abundance in the soil.
- It increasing the availability of phosphorus.

- AM provides necessary strength to resist disease, germs and unfavourable weather conditions.
- It also assures water availability.

7. *Trichoderma* species act as a bio-pesticides- Expain

- These are free-living fungi that are common in soil and root ecosystem.
- They are bio-control agent for
- the control of plant disease
- ability to enhance root growth development
- crop productivity
- resistance to abiotic stress and
- uptake and use of nutrients.

8. *Beauveria* species act as a bio-pesticides- Expain

- This is an entomo-pathogenic fungus.
- It grows naturally in soils throughout the world.
- It acts as a parasite on various arthropod species.
- It causing white muscardine disease without affecting the plant health and growth.
- It also controls damping off of tomato caused by *Rhizoctonia solani*.

9. Mention the main objectives of green manuring

- To increase the content of nitrogen in the soil.
- It helps in improving the structure and physical properties of the soil.
- Example: *Crotalaria juncea, Tephrosia purpurea, Indigofera tinctoria*

10. Describe green *in-situ* manuring and green leaf manuring

- The green manuring can be practised as Green in-situ manuring or Green leaf manuring.
- It refers to the growing of green manuring crops in the border rows or as intercrops along with the main crops.
- Example: Sun hemp, Cowpea, Green gram etc.
- Green leaf manuring is the application of green leaves and twigs of trees, shrubs, plants growing in wastelands and field bunds.
- Example : *Cassia fistula*, *Sesbania grandiflora, Azadirachta indica, Delonix regia, Pongamia pinnata* etc.,

11. What are the principles of genetics and cytogenetics breeding methods designed to develop improved crop varieties.

- The principles of genetics and cytogenetics have elucidated breeding methods such as selection, introduction, hybridization, ploidy, mutation, tissue culture and biotechnology techniques were designed to develop improved crop varieties.

12. Describe quarantine.

- All the introductions must be free from weeds, insects and disease causing organisms.
- This carefully examined process is called **quarantine**.
- It is a strict isolation imposed to prevent the spread of disease.

13. What is the responsible for national bureau of plant genetic resources ?

- It is responsible for introduction and maintenance of germ plasm of various agricultural and horticultural station in our country.
- It is also responsible for maintenance of plant materials of botanical and medicinal interest.

14. Describe national bureau of plant genetic resources (NBPGR)

- It is located at Rangpuri, New Delhi.
- It has four regional plant quarantine stations at Amristsar, Kolkata, Mumbai and Chennai at Meenambakkam.
- It is responsible for introduction and maintenance of germ plasm of various agricultural and horticultural station in our country.
- It is also responsible for maintenance of plant materials of botanical and medicinal interest.

15. Clssify the types of Selection

There are two main types of Selection

i. Natural Selection

ii. Artificial Selection

   a. Mass Selection

   b. Pureline selection

   c. Clonal Selection

16. Describe artificial selection. Write their types.

- It is a human involved process.
- They selected better crop from a mixed population where the individuals differ in character.
- Three main types of artificial selection. They are

  a. Mass Selection

  b. Pureline selection

  c. Clonal Selection

17. What is intergeneric hybridization ? Write their Disadvantages .Give an example.

- The crosses are made between the plants belonging to two different genera is called intergeneric hybridization.

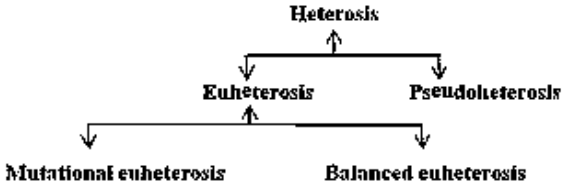
Disadvantages:

- Hybrid sterility, time consuming and expensive procedure.
- **Example:** Raphanobrassica, Triticale.

18. Describe pseudoheterosis

- Also termed as luxuriance.
- Progeny possess superiority over parents in vegetative growth but not in yield and adaptation
- These usually sterile or poorly fertile.

19. Write the schematic representation of heterosis.



20. Describe gamma garden or atomic garden:

- The plants are exposed to radioactive sources for mutation breeding called Gamma Garden or Atomic Garden.
- Example:Cobalt-60 or caesium-137
- The first Gamma garden in India is Bose Research Institute at Calcutta in 1959.
- The second is IARI in 1960 which produced large variation in short type.

21. Explain polyploid breeding

The plants which possess more than two sets of chromosome are called polyploids.

It is a major force in the evolution of both wild and cultivated plants.

It is often exhibit increased hybrid vigour increased both biotic and abiotic stresses, buffering of deleterious mutations.

It often reduced fertility due to meiotic error allowing the production of seedless varieties.

22. Expain autopolyploidy

- When chromosome number is doubled by itself in the same plant, is called autopolyploidy.
- Example: A triploid condition in sugar beets, apples and pear has resulted in the increase in vigour and fruit size, large root size, large leaves, flower, more seeds and sugar content in them.
- It also resulted in seedless tomato, apple, watermelon and orange.

23. What is meant by allopolyploidy ? Give examples.

- The multiplication of chromosome sets are derived from two different species are called allopolyploidy.
- **Example:** Triticale (Triticum durum x secale cereale)
- Raphanobrassica (Brassica oleraceae x Raphanus sativus).

24. Describe NORIN 10

- The cultivars found that Norin 10 dwarfing genes have high photosynthetic rate per unit leaf area and increase respiratory activity.
- Gonjiro Inazuka selected the semi-dwarf wheat variety that became Norin 10.
- He would have never thought that the semi dwarf genes would not only revolutionize the world of wheat but also helped to save more than one billion lives from hunger and starvation.

25. Justify - Dr.M.S.Swaminathan "Father of green revolution in India".

- He is pioneer mutation breeder.
- He has produced Sharbati Sonora, is the amber

grain coloured variety of wheat by mutation.

- It is responsible for green revolution in India.
- Dr. Swaminathan is called "Father of green revolution in India".

26. Write the objectives of breeding for improved nutritional quality

- Protein content and quality
- Oil content and quality
- Vitamin content and
- Micronutrient and mineral content

27. Mention the vegetable crops that are rich in vitamins and minerals released by IARI.

- vitamin A enriched carrots, spinach, pumpkin;
- vitamin C enriched bitter gourd, bathua, mustard, tomato;
- iron and calcium enriched spinach and bathura; and
- protein enriched beans – broad, lablab, French and garden peas.

28. Explain the cross of sugar cane

- *Saccharum bareri* was originally grown in North India, but had poor sugar content and yield.
- Tropical canes grown in South India *Saccharum officinarum* had thicker stems and higher sugar content
- This did not grow well in North India.
- These two species were successfully crossed.
- It results high yield, thick stems, high sugar and ability to grow in the sugarcane areas of North India.

29. Explain pureline selection and add disadvantage of pureline selection

- Johannsen in 1903 coined the word pureline.
- It is a collection of plants obtained by repeated self-pollination from a single homozygous individual.
- A variety formed by this is more homozygosity with respect to all genes.

Disadvantage:

- The new genotypes are never created.
- They are less adaptable and less stable to the environmental fluctuations.

30. Describe clonal selection

- In asexually propagated crop,
- progenies derived from a plant resemble in genetic constitution with the parent plant as they are mitotically divided.
- Based on their phenotypic appearance, clonal selection is employed to select improved variety from a mixed population (clones).
- The selected plants are multiplied through vegetative propagation to give rise to a clone.
- The genotype of a clone remains unchanged for a long period of time.

31. Describe hybridization

- The method of producing new crop varieties in which two or more plants of unlike genetically constitution is crossed together is called Hybridization.
- Hybridization results a progeny called hybrid.
- Hybridization offers improvement in crop.
- It is the combining together the desirable characters of two or more varieties or species.
- The first natural hybridization was observed by Cotton Mather in maize.

32. In the given table crop, variety and insects pests are given. find out the a, b and c

Crop	Variety	Insect pests
Brassica (rapeseed mustard)	**a**	Aphids
b	Pusa Sem 2 Pusa Sem 3	Jassids, aphids and fruit borer
Okra (Bhindi)	Pusa Sawani Pusa A-4	**c**

a) Pusa Gaurav b) Flat been

c) Shoot and Fruit borer

33. Name some of the Conventional Plant Breeding Methods

- Plant introduction, selection, hybridization, heterosis, mutation breeding, polyploidy breeding and green revolution are the different methods of conventional breeding.

34. What is meant by green revolution or third agricultural revolution ?

- The intensive plan of 1960's to increase crop yield in developing countries.

- Introducing the high yielding, resistant varieties, increased irrigation facilities, fertilizer application and better agricultural management is called green revolution or third agricultural revolution.

35. Describe about mutational euheterosis

Simplest type of euheterosis.

It results from the sheltering or eliminating of the deleterious, unfavourable often lethal, recessive, mutant genes by their adaptively superior dominant alleles in cross pollinated crops.

PART – D

ADDITIONAL QUESTIONS (5 MARKS)

1. Write the possible changes in the plant species due to domestication.

The possible changes in the plant species due to domestication are listed below;

- Adaptation to a greater diversity of environments and a wider geographical range.
- Simultaneous /uniform flowering and fruiting.
- Lack of shattering or scattering of seeds.
- Increased size of fruits and seeds.
- Change from a perennial to annual habit.
- Change in breeding system.
- Increased yield.
- Increased resistance for disease and pest.
- Developing seedless PARThenocarpic fruit.
- Enhancing colour, appearance, palatability and nutritional composition.

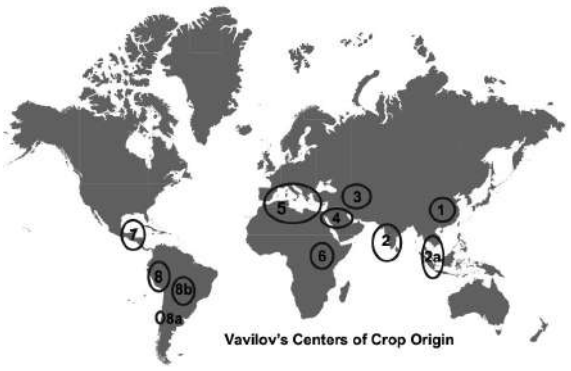
2. Describe Nikolai Ivanovich Vavilov (1887-1943) contribution

- He made an inventory of the diverse forms of our most important cultivated plants and their distribution based on variety of facts obtained from morphology, anatomy, cytology, genetics and plant geography.
- Vavilov has given the centre of diversity of a crop species which may be the centre of origin for that species.
- Vavilov initially proposed eight main geographic centres of origin originally in 1926.
- Later (1935) he named 11 centres of origin by dividing few centres into two and three centres and added a new centre USA thus making the 8 centres of origin into 12.

3. Describe Harlan (1971) contribution.

- According to Harlan agriculture originated independently in three different areas in different times or simultaneously. Hence a crop may not have a single centre of origin.
- Harlan says that the centre of crop plant means the places of agricultural origin of the crop plants.
- The non-centre denotes the place where agriculture of the crop was introduced and spread.
- Thus centre and non-centre interact with each other.

4. Tabulate Vavilov's Centre of Crop Origin and Crops domesticated



Vavilov's Centers of Crop Origin

	Vavilov's Centre of Crop Origin	Crops domesticated
1	China	Foxtail millet, soybean, bamboo, onion, crucifers.
2	India	Rice, sugarcane, mango, orange, eggplant, sesame.
2 a	South East Asia	Rice, banana, coconut, clove, hemp.
3	Central East	Wheat, pea, hemp, cotton etc.
4	The Near East	Wheat, rye, many subtropical and tropical fruits.
5	Mediterranean	Olive, vegetables, oil yielding plants, wheats
6	Ethiopia (Abyssinian)	Wheat, barley, sesame, castor, coffee.

	Vavilov's Centre of Crop Origin	Crops domesticated
7	Mesoamerica (South Mexican & Central American Centre)	Maize, bean, sweet potato, papaya, guava, tobacco.
8	South America	Tomato, pine-apple
8 a	The Chiloe Centre	Potato
8 b	The Brazilian –Paraguayan Centre	Groundnut, cashew nut, pine apple, peppers, rubber.

5. Vavilov's Centre of Crop Origin is given world map. Identify the vavilov's centre 1 to 8 b

	Vavilov's Centre of Crop Origin
1	China
2	India
2 a	South East Asia
3	Central East
4	The Near East
5	Mediterranean
6	Ethiopia (Abyssinian)
7	Mesoamerica (South Mexican & Central American Centre)
8	South America
8 a	The Chiloe Centre
8 b	The Brazilian –Paraguayan Centre

6. Mention indian plant breeders and their contributions

a. **Dr.M.S.Swaminathan** – He is pioneer mutation breeder.

b. **Sir.T.S.Venkataraman** – An eminent sugarcane breeder.

c. **Dr.B.P.Pal** – Famous wheat breeder, developed superior disease resistant varieties of wheat.

d. **Dr.K.Ramiah** – Eminent rice breeder, developed several high yielding varieties of rice.

e. **N.G.P.Rao** – An eminent sorghum breeder, developed world's first hybrid of Sorghum (CSH-1).

f. **C.T.Patel** –. Who developed world's first cotton hybrid

g. **Choudhary Ram Dhan** – Wheat breeder, who is famous for C-591 variety of wheat, which is made Punjab as wheat granary of India.

7. Explain the classification of biofertilizers

Biofertilizers are classified as follows.

N_2 fixing Biofertilize

- Free-living *Azotobacter, Clostridium,Anabaena, Nostoc,*
- Symbiotic *Rhizobium, Anabaena azollae*
- Associative Symbiotic *Azospirillum*

P Solubilizing Biofertilizer

- Bacteria*Bacillus subtilis,Pseudomonas striata*
- Fungi *Penicillium, Aspergillus*

P Mobilizing Biofertilizers

- Arbuscular Mycorrhiza *Glomus, Scutellospora*
- Ectomycorrhiza *Amanita.*

Biofertilizer for Micro nutrients

- Silicate andZinc solubilizers *Bacillus.*

Plant Growth Promoting Rhizobacteria

- Pseudomonas *Pseudomonas fluorescence*

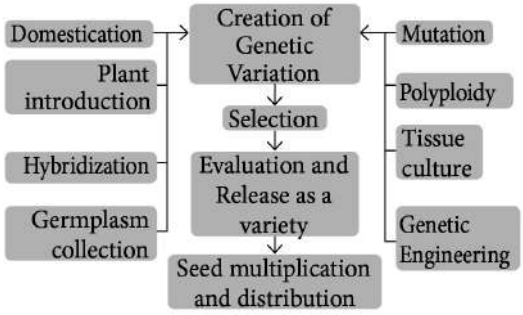
8. Explain various seaweed liquid fertilizer (SLF).

- Seaweed liquid fertilizer contains cytokinin, gibberellins and auxin aPART from macro and micro nutrients.
- Most seaweed based fertilizers are made from **kelp** (brown algae)
- It grows to length of 150 metres.
- Liquid seaweed fertilizer is not only organic but also eco-friendly.
- The **alginates** in the seaweed that reacts with metals in the soil and form long, cross-linked polymers in the soil.
- These polymers improve the crumbing in the soil, swell up when they get wet.
- This retain moisture for a long time.
- They are especially useful in organic gardening which provides carbohydrates for plants.
- **Seaweed** has more than 70 minerals,vitamins and enzymes.
- It promotes vigorous growth.
- Improves resistance of plants to frost and disease.
- Seeds soaked in seaweed extract germinate much rapidly and develop a better root system.

9. Enumerate the objectives of plant breeding

- To increase yield, vigour and fertility of the crop
- To increase tolerance to environmental condition, salinity, temperature and drought.
- To prevent the premature falling of buds, fruits etc.
- To improve synchronous maturity.
- To develop resistance to pathogens and pests.
- To develop photosensitive and thermos-sensitive varieties.

10. Draw the diagrammatic representation steps in plant breeding.



11. Explain two types of introduction ?

(1) **Primary introduction**

- The introduced variety is well adapted to the new environment without any alternation to the original genotype.

(2) **Secondary introduction**

- The introduced variety is subjected to selection to isolate a superior variety.
- These superior variety hybridized with a local variety to transfer one or a few characters.
- The botanical garden are played a significant role. in plant introduction.
- **Example :**
- Tea varieties from China and North East India initially grown in Botanical Garden of Kolkata.
- Then the appropriate clones have selected.
- These introduced to different PARTs of India.

12. Explain mass selection and add disadvantage of mass selection

- A large number of plants of similar morphological characters are selected.
- Their seeds are mixed together to constitute a new variety.
- The population obtained are more uniform than the original population.
- The population are not individually tested.
- After repeated selection for about five to six years.
- The selected seeds are multiplied and distributed to the farmers.

Disadvantage :

- It is difficult to distinguish the hereditary variation from environmental variation.

13. Rearrange the following terms based on the steps in hybridization and explain

Bagging, Crossing, Emasculation, Harvesting seeds and raising plants, Selection of Parents

Steps involved in hybridization are as follows.

1. Selection of Parents 2. Emasculation 3. Bagging
4. Crossing 5. Harvesting seeds and raising plants

1. **Selection of Parents**

Male and female plants of the desired characters are selected.

It should be tested for their homozygosity.

2. **Emasculation**

The removal of anthers to prevent self pollination before anthesis is called emasculation**.**

3. **Bagging**

The stigma of the flower is protected against any undesirable pollen grains, by covering it with a bag.

4. **Crossing**

Transfer of pollen grains from selected male flower to the stigma of the female emasculated flower.

5. **Harvesting seeds and raising plants**

The pollination leads to fertilization and finally seed formation takes place.

The seeds are grown into new generation which are called hybrid.

14. Explain mutation breeding

- Muller and Stadler (1927- 1928) coined the term mutation breeding.
- It is a new method of conventional breeding procedures.
- The advantage is to improving the defect without losing agronomic and quality in agriculture and crop improvement.

- Mutation means the sudden heritable changes in the genotype or phenotype of an organism.
- Gene mutations are of considerable importance in plant breeding.
- They provide essential inputs for evolution,re-combination and selection.
- It is the only method for improving seedless crops.
- Mutation induces by radiation such as UV short wave, X-ray, Alpha (α), Beta (β), Gamma waves.
- Many chemicals such as cesium,EMS (ethyl methane sulfonate), nitromethyl, urea induces mutation.
- **Example:** Triple gene dwarf wheat with increase in yield and height. Atomita 2 - rice with saline tolerance and
- pest resistance.

15.**Explain green revolution**

- Green revolution the term was coined by William S.Gaud in (1968).
- The cumulative result of a series of research, development, innovation and technology transfer initiatives are called Green revolution.
- Agricultural production (especially wheat and rice) manifolds between the 1940's and the late 1960's.
- Introducing the high yielding, resistant varieties, increased irrigation facilities, fertilizer application and better agricultural management is called Green revolution or third Agricultural Revolution.
- The scheme began in Mexico in 1940's.
- It was successfully introduced in PARTs of India, Asia, Middle East and Latin America.
- Dr.B.P Pal the Director of IARI, requested M.S.Swaminathan to arrange for Dr.NE Borlaug visit to India and for obtaining a wide range of dwarf wheat possessing the Norin 10 dwarfing genes from Mexico.
- In 1963 semi-dwarf wheat of Mexico was introduced to india.
- India got five prolonged strategies for breeding a wide range of high varieties like Sonora 64, Sonalika and Kalyansona possessing a broad spectrum of resistance to major biotic and abiotic condition.
- M.S.Swaminathan produced the first semi-dwarf fertiliser responsive hybrid variety of rice TNI (Taichung Native-1) in 1956 from Taiwan.
- The derivatives were introduced in 1966. Later better yielding semi dwarf varieties of rice Jaya and Ratna developed in India.

16. Tabulate the crop, variety and resistance to diseases

Crop	Variety	Resistance to diseases
Wheat	Himgiri	Leaf and Stripe rust, hill bunt
Brassica	Pusa swarnim (Kara rai)	White rust
Cauliflower	Pusa Shubhra, Pusa snowball K-1	Black rot and curl blight black rot
Cowpea	Pusa Komal	Bacterial blight
Chilli	Pusa Sadabahar	Chilly mosaic virus, Tobacco mosaic virus and Leaf curl.

17. How Norman E. Borlaug form the base for 'green revolution

- He is a plant pathologist plant breeder.
- He devoted his life at the International Maize and Wheat improvement centre at Sonord in Mexico.
- He developed dwarf wheat varieties like Norin-10, Sonora-64, Lerma rojo-64, etc.
- It has a high yielding, rust resistant, non-lodging which are now being cultivated in many countries.
- This formed the base for 'green revolution'.
- He was awarded a Nobel prize for Peace in 1970.

18. Explain Nel Jayaraman contribution to rice

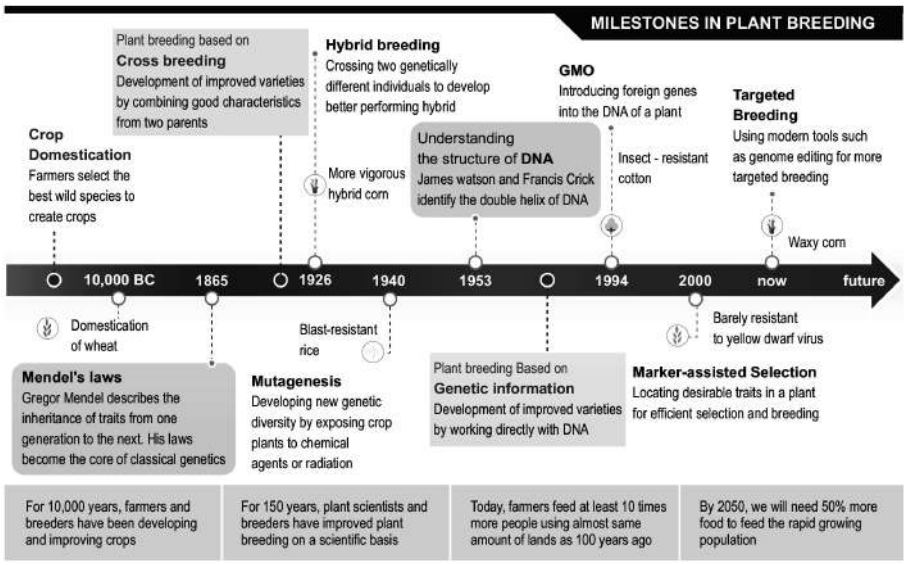
- Mr. Jayaraman, hails from Adirangam village in Tiruvarur district.
- He was a disciple of Dr.Nammalvar and state co-ordinator of 'Save our rice campaign, Tamil Nadu.
- He strived hard for conservation of traditional rice varieties.
- He had trained a team of farmers and regularly update them on the current issues.
- In 2005, he organized a first ever traditional paddy seed festival in his farm as an individual.

- The 10th seed festival in May 2016 at Adhirangam.
- 156 different traditional varieties were distributed to more than 7000 farmers across Tamil Nadu.
- He gave a talk in Philippines at the International Rice Research Institute (IRRI) on his work and mission.
- In 2011, he received the State Award for best organic farmer. for his contribution to organic farming.
- In 2015, he received the National Award for best Genome Savior.

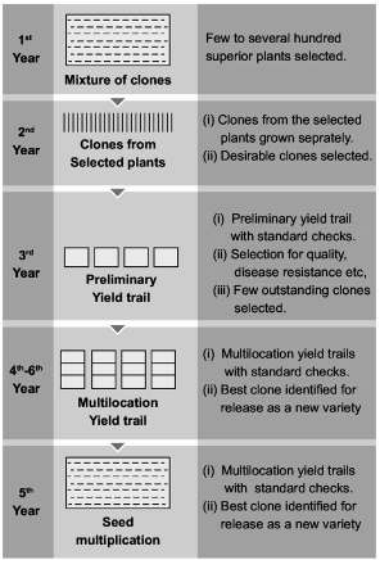
19. Plant Breeding for Developing Resistance to Insect Pests

- Insect resistance in host crop plants may be due to morphological, biochemical or physiological characteristics.
- Hairy leaves resistance to insect pests.
- Example: resistance to jassids in cotton and cereal leaf beetle in wheat.
- In wheat, solid stems lead to non-preference by the stem sawfly.
- Smooth leaves and nectar-less cotton varieties do not attract bollworms.
- High aspartic acid, low nitrogen and sugar content in maize leads to resistance to maize stem borers.

20. Pick up the milestone in plant breeding



21. Diagramatic representation of Clonal Selection



22. Name the process of the given diagram

a. Emasculation
b. Bagging (Wheat plant)

UNIT X : ECONOMIC BOTANY

CHAPTER 10

ECONOMICALLY USEFUL PLANTS AND ENTREPENEURIAL BOTANY

POINTS TO REMEMBER

- All cereals are members of grass family (Poaceae) that are grown for their edible starchy seeds.
- Cereals can be classified into two different types based on their size namely Major Cereals and Minor Cereals.
- Rice is the chief source of carbohydrate.
- Earliest evidence for wheat cultivation comes from Fertile Crescent region.
- Millets are gluten free and have less glycemic index.
- Thinai porridge is given to lactating mother.
- Pulses are the edible seeds that are harvested from the fruits of Fabaceae.
- India contributes to 80% of the global production of black gram.
- Green gram flour is traditionally used as a cosmetic, especially for the skin.
- Vegetables are provide many nutrients, including potassium, fiber, folic acid and vitamins A, E and C.
- Edible fruits are fleshy structures with a pleasant aroma and flavours.
- Temperate fruits - apple, pear, plum and tropical fruits - mango, jack, banana.
- Nuts are packed with a good source of healthy fats, fibre, protein, vitamins, minerals and antioxidants.
- The essential oils or volatile oils which possess aroma evaporate or volatilize in contact with air.
- Whole seeds or endosperm form the sources of vegetable oils.
- Sesame oil is considered as a healthy oil in Southern Indian culture.
- Karnataka is the largest coffee producing state in India followed by Tamil Nadu and Kerala.
- Cardamom is called as "Queen of Spices".
- Pepper is referred to as the "King of Spices" and also termed as "Black Gold of India".
- Erode in Tamil Nadu is the World's largest wholesale turmeric market.
- Pungency of Chillies is measured in Scoville Heat Units (SHU).
- The name tamarindus is of Arabian origin, which means "dates of India".
- Teak is one of best timbers of the world
- Kerala is the largest producer of rubber in India followed by Tamil Nadu.
- Charles Goodyear invented vulcanization in 1839.
- The Chinese discovered the paper that was prepared from the inner bark of paper mulberry
- Aloin' (a mixture of glucosides) and its gel are used as skin tonic.*Aloe vera* gel is used in skin care cosmetics.
- Essential oils are found at different parts of the plant such as leaves, (curry leaf, mint), flowers (rose, jasmine), fruits (citrus, straw berry) and wood (sandal, eucalyptus).
- 'Madurai Malli' has been given the Geographical Indications (GI) mark by the Geographical indication Registry of India.
- Madurai Malli is the second GI tag for Jasmine after 'Mysore Malli'.
- The TSM focus on healthy lifestyle and healthy diet for maintaining good health and disease reversal.
- Siddha is principally based on the **Pancabūta** philosophy.
- The **Ayurvedic Pharmacopoeia** of India lists about 500 plants used as source of drugs.
- Major tribal communities in Tamil Nadu who are known for their medicinal knowledge include **Irulas, Malayalis, Kurumbas, Paliyans** and **Kaanis**.
- At present, 90% collection of medicinal plants is from the non-cultivated sources.
- Medicinally useful molecules obtained from plants that are marketed as drugs are called Biomedicines.
- Medicinal plants which are marketed as powders or in other modified forms are known as Botanical medicines.

- Concoction of *Andrographis paniculata* and eight other herbs (Nilavembu Kudineer) is effectively used to treat malaria and dengue.
- The Narcotics Control Bureau (NCB) is the nodal drug law enforcement and intelligence agency of India.
- NCB is responsible for fighting drug trafficking and the abuse of illegal substances.
- Organic farming is thus considered as the movement directed towards the philosophy of **Back to Nature.**
- Botanical pest repellent and insecticide made with the dried leaves of *Azadirachta indica*

S. No.	Plant name	Bot. name	Family	Origin	Area of cultivation
1	Rice	*Oryza sativa*	Poaceae	South East Asia	China, India and Thailand
2	Wheat	*Triticum aestivum*	Poaceae	Fertile Crescent region	U.P,Punjab, Haryana, Rajasthan, M.P and Bihar.
3	Ragi	*Eleusine coracana*	Poaceae	East Africa and Asia	India
4	Sorghum	*Sorghum vulgare*	Poaceae	Africa.	
5	Foxtail Millet	*Setaria italic*	Poaceae	China	India
6	Kodo Millet	*Paspalum scrobiculatum*	Poaceae	West Africa	
7	Black gram	*Vigna mungo*	Fabaceae	India	U. P, Chattisgarh and Karnataka
8	Red gram	*Cajanus cajan*	Fabaceae	Southern India	
9	Green gram	*Vigna radiate*	Fabaceae	India Maharashtra.	M.P, Karnataka and T. N
10	Lady's finger	*Abelmoschus esculentus*	Malvaceae	Tropical Africa	Assam, Maharashtra and Gujarat, Coimbatore, Dharmapuri and Vellore
11	Mango	*Mangifera indica*	Anacardiaceae	Southern Asia, especially Burma and Eastern India	A.P, Bihar, Gujarat and Karnataka. Salem, Krishnagiri, Dharmapuri
12	Cashew nut	*Anacardium occidentale*	Anacardiaceae	Brazil	Kerala, Karnataka, oa,Maharashtra, T. N, and Orissa.
13	Sugarcane	*Saccharum officinarum*	Poaceae		Except Kanyakumari and Nilgiris of T.N.
14	Palmyra	*Borassus flabellifer*	Arecaceae	Africa, Asia and New Guinea	
15	Groundnut	*Arachis hypogaea*	Fabaceae	Brazil. Portuguese	Africa, South East Asia, India Philippines,Gujarat,A.P and Rajasthan
16	Sesame	*Sesamum indicum*	Pedaliaceae	Africa	W.B and M. P
17	Coffee	*Coffea arabica*	Rubiaceae	Tropical Ethiopia	Karnataka, T.N and Kerala
18	Cardamom	*Elettaria cardamomum*	Zingiberaceae	Southern India and Sri Lanka	Western Ghats, and North Eastern India
19	Black Pepper	*Piper nigrum*	Piperaceae	Western Ghats of India	Kerala, Karnataka and T.N
20	Turmeric	*Curcuma longa*	Zingiberaceae	Southern Asia	Erode in T. N
21	Chillies	*Capsicum annuum*	Solanaceae	South America	
22	Tamarind	*Tamarindus indica*	Fabaceae	tropical Africa	India, Myanmar, south asia and Africa and Central America
23	Cotton	*Gossypium* spp	Malvaceae		Gujarat, Maharashtra, A.P and T.N
24	Jute	*Corchorus* spp	Malvaceae	Indo-Burmese	Gangetic plains of India and Bangladesh
25	Teak	*Tectona grandis*	Lamiaceae	South east Asia	Bengal, Assam, Kerala, T.N and North-West India.
26	Rubber	*Hevea brasiliensis*	Euphorbiaceae	Brazil .	Kerala ,T.N.

S. No.	Plant name	Bot. name	Family	Origin	Area of cultivation
27	Henna	*Lawsonia inermis*	Lythraceae	North Africa and South-west Asia	Gujarat, M. P and Rajasthan
28	Aloe	*Aloe vera*	Asphodelaceae	Sudan	Rajasthan, Gujarat, Maharashtra, A. P and T.N.
29	Jasmine	*Jasminum grandiflorum*	Oleaceae	North-western Himalayas	Madurai and Thovalai
30	Keezhanelli	*Phyllanthus amarus*	**Phyllanthaceae**	Tropical America	
31	Nilavembu	*Andrographis paniculata*	Acanthaceae		
32	Opium poppy	*Papaver somniferum*	Papaveraceae	South Eastern Europe and Western Asia	M. P, Rajasthan and U.P
33	Marijuana	*Cannabis sativa*	Cannabiaceae	China	Gujarat, Himachal Pradesh, Uttarkand, U.p and M. P

PART – A

(1 MARK)

Book Evaluation

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 **Ans : b**

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. **Ans : a**

3. Groundnut is native of _____

a) Philippines b) India

c) North America d) Brazil **Ans : d**

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 **Ans : a**

5. Tectona grandis is coming under family

a) Lamiaceae b) Fabaceae

c) Dipterocaipaceae d) Ebenaceae **Ans : a**

6. Tamarindus indica is indigenous to

a) Tropical African region

b) South India, Sri Lanka

c) South America, Greece

d) India alone **Ans : a**

7. New world species of cotton

a) Gossipium arboretum

b) G.herbaceum

c) Both a and b

d) G.barbadense **Ans : d**

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 **Ans : c**

9. Find out the correctly matched pair.

a) Rubber *Shorea robusta*

b) Dye *Lawsonia inermis*

c) Timber *Cyperus papyrus*

d) Pulp *Hevea brasiliensis* **Ans : b**

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 **Ans : c**

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 **Ans :b**

12. The active principle trans-tetra hydro canabial is present in

a) *Opium* b) *Curcuma*

c) Marijuana d) *Andrographis* **Ans :c**

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

Ans : c

14. The only cereal that has originated and domesticated from the New world.

a) *Oryza sativa* b)*Triticum asetumn*

c) *Triticum duram* d) *Zea mays* **Ans : d**

PART – B,C AND D

(2,3 AND 5 MARKS)

15. Write the cosmetic uses of *Aloe*.

- 'Aloin' (a mixture of glucosides) and its gel are used as skin tonic.
- It has a cooling effect and moisturizing characteristics.
- So used in preparation of creams, lotions, shampoos, shaving creams, after shave lotions and allied products.
- It is used in gerontological applications for rejuvenation of aging skin.
- It has multiple properties such as emollient, antibacterial, antioxidant, antifungal and antiseptic.
- *Aloe vera* gel is used in skin care cosmetics.

16. What is pseudo cereal? Give an example.

Pseudo-cereal is one of any non -grasses that are used in much the same way as cereals.

Example: ***quinoa***

17. Discuss which wood is better for making furniture.

- Teak wood is better for making furniture.
- The heartwood is golden yellow to golden brown when freshly sawn, turning darker when exposed to light.Known for its durability as it is immune to the attack of termites and fungi.
- The wood does not split or crack and is a carpenter friendly wood.

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

- My suggestion for alternative is 'Henna' dye
- An orange dye 'Henna' is obtained from the leaves and young shoots of *Lawsonia inermis.*
- The principal colouring matter of leaves 'lacosone" is harmless and causes no irritation to the skin.
- This dye has long been used to dye skin, hair and finger nails.

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

- Siddha is principally based on the **Pancabūta** philosophy.
- According to this system three humors namely **Vātam, Pittam** and **Kapam.**
- These are responsible for the health of human beings .
- If any disturbance in the equilibrium of these humors result in ill health.

20. Give definitions for organic farming?

- The organic farming is an alternative agricultural system.
- The plants/crops are cultivated in natural ways by using biological inputs.
- This maintain soil fertility and ecological balance thereby minimizing pollution and wastage.
- Use of biofertilizers is one of the important components of integrated organic farm management, as they are cost effective and renewable source of plant nutrients to supplement the chemical fertilizers for sustainable agriculture.
- The several microorganisms and their association with crop plants are being exploited in the production of biofertilizers.
- The organic farming is thus considered as the movement directed towards the philosophy of Back to Nature.

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

- Nilavembu (*Andrographis paniculata)* is known as the King of Bitters.

The medicinal importance of nilavembu

- Andrographolides is the major chemical component.
- Andrographis is a potent hepatoprotective.
- It is widely used to treat liver disorders.
- Concoction of *Andrographis paniculata* and eight other herbs (Nilavembu Kudineer) is effectively used to treat malaria and dengue.

22. Differentiate bio-medicines and botanical medicines.

- **Biomedicines**

The 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.

The origin and area of cultivation of green gram

- It is a native of India and the archaeological evidences are found in Maharashtra.
- It is cultivated in Madhya Pradesh, Karnataka and Tamil Nadu.

The origin and area of cultivation of red gram / pigeon pea

- It is the only pulse native to Southern India.
- It is mainly grown in Maharashtra, Andhra Pradesh, Madhya Pradesh, Karnataka and Gujarat.

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

- It is a variety of very small seeds.
- Originally cultivated by ancient people in Africa and Asia.
- They are gluten free and have less glycemic index.

Types and examples

- Finger Millet – Ragi - *Eleusine coracana*
- Foxtail Millet- Thinai - *Setaria italic*
- Kodo Millet- varagu - *Paspalum scrobiculatum*

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 correct. Drinking coffee in moderation provides the following health benefits:

- Caffeine enhances release of acetylcholine in brain, which in turn enhances efficiency.
- It can lower the incidence of fatty liver diseases, cirrhosis and cancer.
- It may reduce the risk of type 2 diabetes.

26. Enumerate the uses of turmeric.

- It is one of the most important and ancient Indian spices.
- It is used traditionally over thousands of years for culinary, cosmetic, dyeing and for medicinal purposes.

- It is an important constituent of curry powders.
- It is used as a colouring agent in pharmacy, confectionery and food industry.
- Rice coloured with turmeric (yellow) is considered sacred and auspicious which is used in ceremonies.
- It is also used for dyeing leather, fibre, paper and toys.
- Curcumin extracted from turmeric is responsible for the yellow colour.
- Curcumin is a very good anti-oxidant which may help fight various kinds of cancer.
- It has anti-inflammatory, anti-diabetic, anti-bacterial, anti-fungal and anti-viral activities.
- It stops platelets from clotting in arteries, which leads to heart attack.

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

TSM means Traditional Systems of Medicines

- India has a rich medicinal heritage.
- A number of Traditional Systems of Medicine (TSM) are practiced in India
- some of which come from outside India.

Traditional systems classification

- Traditional Systems of Medicine (TSM) in India can be classified into
- 1.**institutionalized** or documented

  2.**non-institutionalized** or oral traditions.

Institutionalized indian systems

- Institutionalized Indian systems include Siddha and Ayurveda.
- These are practiced for about two thousand years.
- These systems have prescribed texts in which the symptoms, disease diagnosis, drugs to cure, preparation of drugs, dosage and diet regimes, daily and seasonal regimens.

Non- institutional systems,

- This do not have such records and or practiced by rural and tribal peoples across India.
- The knowledge is mostly held in oral form.
- The TSM focus on healthy lifestyle and healthy diet for maintaining good health and disease reversal.

28. Write the uses of nuts you have studied.

We have studied cashew nut. The uses of cashew nut are as follows.

- Used for garnishing sweets or curries,
- Ground into a paste which forms a base of sauces for curries or some sweets.
- Roasted and raw kernels are used as snacks.

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

Jasmine, as a floral perfume, ranks next to the rose oil.

- The essential oil is present in the epidermal cells of both the sepals and petals.
- One ton of Jasmine blossom yields about 2.5 to 3 kg of essential oil.

Role of *Jasminum* in perfuming

- Jasmine flowers are used in India for worship, ceremonial purposes, incense and fumigants,
- It is used for making perfumed hair oils, cosmetics and soaps.
- Jasmine oil is valued for its soothing, relaxing, antidepressant qualities.
- Jasmine blends well with other perfumes.
- It is used in air freshners, anti-perspirants, talcum powders, shampoos and deodorants.

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

Two plants we have studied is

1. **Keezhanelli (***Phyllanthus amarus)* Family: Euphorbiaceae (Now inPhyllanthaceae)
2. **Nilavembu (***Andrographis paniculata)* Family : Acanthaceae

1. Active principle of *Phyllanthus amarus*: Phyllanthin is the major chemical component.

Medicinal values

- *Phyllanthus* is hepato-protective plant used in Tamil Nadu for the treatment of Jaundice.

2. Active principle of *Andrographis paniculata* : Andrographolides is the major chemical component.

Medicinal values

- Andrographis is a potent hepatoprotective.
- It is widely used to treat liver disorders.

- Concoction of *Andrographis paniculata* and eight other herbs (Nilavembu Kudineer) is effectively used to treat malaria and dengue.

31. Write the economic importance of rice.

- Rice is used as a staple food in Southern and North East India.
- Flaked rice (Aval), Puffed rice / parched rice (Pori) are used as breakfast or as snack food.
- Rice bran oil is used in culinary and industrial purposes.
- Husks are used as fuel, and in packing material 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.
- It is based on the texts written by 18 Siddhars.
- There are different opinions on the constitution of 18 Siddhars.
- The Siddhars are not only from Tamil Nadu, but have also come from other countries.
- The entire knowledge is documented in the form of poems in Tamil.
- Siddha is principally based on the **Pancabūta** philosophy.
- According to this system three humors namely **Vātam, Pittam** and **Kapam.**
- These are responsible for the health of human beings .
- If any disturbance in the equilibrium of these humors result in ill health.
- The drug sources of Siddha include plants, animal parts, marine products and minerals.
- This system specializes in using minerals for preparing drugs with the long shelf-life.
- This system uses about 800 herbs as source of drugs.
- Great stress is laid on disease prevention, health promotion, rejuvenation and cure.

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

- The phytochemicals / drugs from some of the plants alter an individual's perceptions of mind by producing hallucination are known as psychoactive drugs.
- These drugs are used in all ancient culture especially by Shamans and by traditional healers.

Origin and area of cultivation of *Cannabis* / Marijuana

- It is native to China.
- States of Gujarat, Himachal Pradesh, Uttarkand, Uttarpradesh and Madhaya Pradesh have legally permitted to cultivate this.

Medicinal properties of *Cannabis* / Marijuana

- The active principle in marijuana is **trans-tetrahydrocanabinal** (THC).
- It is an effective pain reliever and reduces hypertension.
- THC is used in treating **Glaucoma** a condition in which pressure develops in the eyes.
- THC is also used in reducing nausea of cancer patients undergoing radiation and chemotherapy.
- THC provides relief to bronchial disorders, especially asthma as it dilates bronchial vessels.
- Because of these medicinal properties, cultivation of cannabis is legalized in some countries.

Origin and area of cultivation of *opium poppy*

- It is native to South Eastern Europe and Western Asia.
- Madhya Pradesh, Rajasthan and Uttar Pradesh are the licenced states to cultivate opium poppy.

Medicinal properties of poppy

- *Opium* was traditionally used to induce sleep and for relieving pain.
- *Opium* is derived from the exudates of fruits of poppy plants.
- *Opium* yields **Morphine**, a strong analgesic which is used in surgery.
- However, *opium* is an addiction forming drug.

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

- Pepper is referred to as the "King of Spices".
- Cardamom is called as "Queen of Spices".

Origin and area of cultivation of cardamom

- It is indigenous to Southern India and Sri Lanka.
- Cardamom is called as "Queen of Spices".
- In India it is one of the main cash crops cultivated in the Western Ghats, and North Eastern India

Uses of cardamom

- The seeds have a pleasing aroma and a characteristic warm, slightly pungent taste.
- It is used for flavouring confectionaries, bakery products and beverages.
- The seeds are used in the preparation of curry powder, pickles and cakes.
- Medicinally, it as a stimulant and carminative.
- It is also chewed as a mouth freshener.

Origin and area of cultivation of black pepper

- It is indigenous to Western Ghats of India.
- Pepper is referred to as the "King of Spices".
- It termed as "Black Gold of India".
- Kerala, Karnataka and Tamil Nadu are the top producers in India.

Uses of black pepper

- The characteristic pungency of the pepper is due to the presence of alkaloid Piperine.
- Two types of pepper namely black and white pepper.
- It is used for flavouring in the preparation of sauces, soups, curry powder and pickles.
- It is used in medicine as an aromatic stimulant for enhancing salivary and gastric secretions. and stomachic.
- Pepper also enhances the bio-absorption of medicines.

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

Preparation of Organic Pesticide

Mix 120g of hot chillies with 110 g of garlic or onion. Chop them thoroughly. ①

Blend the vegetables together manually or using an electric grinder until it forms a thick paste. ②

Add the vegetable paste to 500 ml of warm water. Give the ingredients a stir to thoroughly mix them together. ③

Pour the solution into a glass container and leave it undisturbed for 24 hours. If possible, keep the container in a sunny location. If not, at least keep the mixture in a warm place. ④

Strain the mixture. Pour the solution through a strainer, remove the vegetables and collect the vegetable-infused water and pour into another container. This filtrate is the pesticide. Either discard the vegetables or use it as a compost. ⑤

Pour the pesticide into a squirt bottle. Make sure that the spray bottle has first been cleaned with warm water and soap to get rid it of any potential contaminants. Use a funnel to transfer the liquid into the squirt bottle and replace the nozzle. ⑥

Spray your plants with the pesticide. Treat the infected plants every 4 to 5 days with the solution. After 3 or 4 treatments, the pest will be eliminated. If the area is thoroughly covered with the solution, this pesticide should keep bugs away for the rest of the season. ⑦

Avoid spraying the plants during the sunny times of the day since it could burn plants. Many other plants possess insect repellent or insecticidal properties. Combinations of these plants can be fermented and used as biopesticide.

PART – A

ADDITIONAL QUESTIONS (1 MARKS)

1. Scientific name of paddy is

a) oryza sativa *b) Triticum aestivum*
c) Avenue sativa *d) zea mays* **Ans** *:* a

2. Food grains which provide the most important staple food for mankind are

a) cereals b)legumes
c) oil seeds d) millets **Ans** *:* a

3. The most important food grains are

a) root b)leaves
c) fruit d) stem **Ans** *:* d

4. Pulses are important source of

a) Proteins b) carbohydrate
c) fats d) sugar **Ans** *:* a

5. Pulses belongs to family

a) Rutaceae b) Malvaceae
c) Fabaceae(d) none of the all **Ans** *:* c

6. Scientific name of chickpea

a) Cajams cajan *b) Zea mays*
c) Cicer arietinum *d) Phaselus mungo* **Ans** *:* c

7. Cotton fiber is

a) Surface fiber b)hard fiber
c) bast fiber d) coir **Ans : a**

8)The most extensively cultivated cotton species

a) Gossypium arboreum *b) Gossypium hirsutum*
c) G .harbecum *d) G .barbadense*
Ans *:* b

9. Cotton fiber are rich in

a) Protein b) Cellulose
c) Lignin d) Hemicellulose
Ans *:* b

10. Mango is a fruit

a) Temperate b) Sub- tropical
c) Tropical d) None of the above
Ans *:* c

11. Tea and coffee is a

a) Distilled beverage b) Alcohol beverage
c) None -alcohol beverage d) Fermented beverage **Ans** *:* c

12. Coffee is mainly grown in

a) Karnataka b) Andhra pardesh
c) kerala d) Orrisa **Ans** *:* a

13. Spices are mainly grown in

a) Kerala b) Andhra pardesh
c) Orisa d) Bihar **Ans** *:* a

14. Black pepper is a

a) Fruit b) Bud
c) Root d) Stem **Ans** *:* a

15. Food base of majority of the population depends only on three grass species namely

a) rice b) wheat
c) maize d) None of the above
Ans *:* d

16. How much percentage of medicinal plants is from the non-cultivated sources.

a).60% b) 80%
c) .90% d) 70% **Ans : c**

17. what is the world's most important non-food commercial crop ?

a) rice b) wheat
c) maize d) Cotton **Ans : d**

18. A mixture of Glucosides are called

a) Aloin b) quinoa
c) poppy d) andrographis **Ans: a**

19. Siddha is principally based on the

a) Vatam b) Pittam
c) Kapam d) all of these **Ans: d**

20. Which is called as the king of bitter?

a) Poppy b) Nilavembu
c) Alove d) quinoa **Ans: b**

21. Write the botanical name of Thinai

a) *Eleusine coracana*
b) *Setaria italica*
c) *Paspalum scrobiculatum*
d) *phyllanthus amaramus* **Ans: b**

22. One ton of Jasmine blossom yields----- kg of essential oil.

a) 2.5 to 3 kg b) 3 to 3.5 kg
c) 2.5 to 4 kg d) 2.5 to 3.5 kg **Ans: a**

23. Phyllanthus amarus belongs to the family

a) Acanthaceae b) Phyllanthaceae
c) Verbenaceae d) Poaceae **Ans: b**

24. Read the statements. Select the correct statement

i. *Phyllanthus* is hepato-protective plant

ii. Phyllanthin is the major chemical component of *Phyllanthus*

iii. *Phyllanthus* widely used to treat liver disorder

iv. Marijuana is a native of Sudan

a) i. and ii. only correct
b) ii. and iii. only correct
c) iii. and iv. only correct
d) iv. and i. only correct **Ans: a**

25. The active principle of THC found in

a) *Cannabis* b) Marijuana
c) *Phyllanthus* d) both a) and b) **Ans: d**

26. King of spices is called

a) Cardamom b) black pepper
c) Morphine d) Keezhanelli **Ans: b**

27. Queen of spices is called

a) Cardamom b) black pepper
c) Blue berry d) none of these **Ans: a**

28. Which of the following is called Black Gold of India?

a) Black night shade b) Black berry
c) Cardamom d) Black pepper **Ans: d**

29. 10,000 food plants are used in the world. How many plant species were brought under cultivation?

a)5,000 b) 4,500 c) 1,500 d) 1,000 **Ans: c**

30. All cereal is derived from the members of

a) Grass family b) Poaceae
c) both a) and b) d) none of these **Ans: c**

31. Cereals are the chief source of

a) Protein b) Fat
c) both a) and b) d) Carbohydrate **Ans: d**

32. The following is a raw material for alcohol and alcoholic beverages

a) Tea b) Coffee
c) both (a) and (b) d) Corn **Ans: d**

33. Finger Millet is rich in

a) Calcium b) Iron
c) Magnesium d) both a) and b) **Ans: a**

34. Which one of the following is the major millets in the world

a) *Sorghum vulgare* b) *Setaric italica*
c) *Eleusine coracana* d) *Chenopodium quinoa* **Ans: a**

35. Sorghum vulgare rich in

a) Calcium b) iron
c) both (a) and (b) d) Magnesium **Ans: c**

36. The porridage is given to lactating mother

a) Varagu b) Samai
c) Thinai d) Ragi **Ans: c**

37. What is the native of black gram?

a) Mexico b) India
c) China d) Africa **Ans: b**

38. Which of the following pulse provide potassium, fibre, folic acid and vitamins A, E and C

a) Red gram b) green gram
c) black gram d) none of these **Ans :b**

39. Which of the following are fleshy structure with a pleasant aroma and flavours

a) Vegetables b) Spices
c) Pulses d) Edible Fruits **Ans: d**

40. National fruit of India is

a) Apple b) Pear
c) Plum d) Mango **Ans: d**

41. Apple, Pear, Plum are the examples of

a) Tropical fruits b) Sun-Tropical fruits
c) Temperate fruits d) None of these **Ans: c**

42. Anacardium occidentale originated in

a) Sudan b) Brazil
c) France d) China **Ans: b**

43. Sugar found in the plant(s) of

a) Sugar cane b) Palmyra
c) Apple d) both a) and b)
Ans: d

44. i. Ground nut is native of Brazil
ii. Gingelly originated from South America
iii. *Seasame* oil used for culinary purposes in India
iv. Coffee and Tea are the alcoholic beverages

a) i. and ii. are correct b) ii. and iv. are correct
c) i. and iii. are correct d) all are correct **Ans: c**

45. Assertion: Spices are aromatic plant products and are characterized by sweet or bitter taste.
Reason: Spices are added maximum quantities during the cooking process

a) Assertion is correct; Reason is wrong
b) Assertion is wrong; Reason is correct
c) both are correct and reason is the correct explanation
d) both are correct and reason is not the correct explanation **Ans: a**

46. Sweet tamarinds are sold as table fruits in India imported from

a) China b) Thailand
c) Malaysia d) both (b) and (c)
Ans: d

47. Tyre and other automobile parts manufacturing industries consume _____ of the rubber production.

a) 50% b) 60% c) 70% d) 8% **Ans: c**

48. Purified dissolving pulp is used as a basic material in the manufacture of

a) Cellophane b) Cellulose
c) Acetate films d) None of these
Ans: d

49. Perfumes are manufactured from essential oil which are

a) non-volatile b) aromatic
c)volatile d) both b) and c)
Ans: d

50. Match it correctly

A.	Leaves	i.	Strawberry, Citrus
B.	Flowers	ii.	Sandal, Eucalyptus
C.	Fruits	iii.	Curry leaves, Mint
D.	Wood	iv.	Rose, Jasmine

	A	B	C	D
a)	iii.	i.	iv.	ii.
b)	iii.	iv.	i.	ii.
c)	iv.	iii.	ii.	I,
d)	i.	ii.	iii.	iv.

Ans: a

51. It has been given the Geographical indication (GI) mark by the Geographical indication Registry of India

a) Mysore Malli b) Madurai Malli
c) Both (a) and (b) d) None of these
Ans: c

52. Major cultivation centers of Jasmine is

a) Mysore b) Madurai
c) Thovalai d) both b) and c)
Ans: d

53. The core knowledge of Ayurveda System of Medicine is documented by

a) Charaka b) Sushruta
c) Vagbhata d) all of these **Ans: d**

54. Decoction of roots is given as a diaphoretic in malarial fever

a) Holy basil b) gooseberry
c) Vilvam d) Veldt grape **Ans: c**

55. Paste obtained from the powdered stem and root of this plant is used in bone fracture.

a) Holy basil b) gooseberry
c) Vilvam d) Veldt grape **Ans: d**

56. Powdered leaves are used to cure bedsores and infected wounds

a) Holy basil b) gooseberry
c) Acalypha d) Vilvam **Ans: c**

57. It is a potent rejuvenator and immune modulator

a) Holy basil b) gooseberry
c) Vilvam d) Veldt grape **Ans: b**

58. It is responsible for fighting drug trafficking and the abuse of illegal substances.

a) Narcotics Control Bureau
b) Geographical indication Registry of India
c) Geographical Indication
d) Scoville Heat units **Ans: a**

59. Pungency of chilies is measures in the unit of

a) TCH b) NCB c) SHU d) SCP **Ans: b**

60. The study of how new businesses are created using plant resources are called

a) economic botany
b) entrepreneurial botany
c) ethno botany
d) none of these **Ans: b**

61. Mushroom cultivation, Bonsai, SCP production and cultivating medicinal plants are the activity of

a) ethnobotany
b) Economic botany
c) entrepreneurial botany
d) none of these **Ans: c**

62. Botanical Pest repellent and insecticide made with the dried leaves of

a) *Aegle marmelos* b) *Acalyphe indica*
e) *Cissus quadrangularis* d) *Azadirachta indica*
Ans: d

63. Which one of the following matches is correct?

a) Pseudo cereal - quinoa
b) Anacardium - sesamum
c) Poaceae - cashew nut
d) Pedaliaceae - saccharum **Ans: a**

64.

A. *Carolina reaper pepper*	i.	30,000 to 50,000 SHU
B. *Naga viper*	ii.	2,2000,000 SHU
C. *Cayenne pepper*	iii.	1,349,000 SHU
D. Use of garlic	iv.	2,500 years

	A	B	C	D
a)	ii.	iii.	i.	iv.
b)	ii.	i.	iii.	iv.
c)	i.	ii.	iii.	iv.
d)	iv.	iii.	ii.	i.

Ans: a

65. i. Condiments are flavouring substances having a sharp taste.

ii. These are usually add to find after cooking

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 **Ans: b**

66. *Oryza sativa* is native of

a) North America b) Brazil
c) China d) South east Asia
Ans: d

67. State tree of Tamil Nadu is a

a) Mango b) Palmyra
c) Neem d) Asoka **Ans: b**

PART – B

ADDITIONAL QUESTIONS (2 MARKS)

1. How the economically useful plants are classified based on their utility?

They are classified into food plants, fodder plants, fibre plants, timber plants, medicinal plants, and plants used in paper industries, dyes and cosmetics.

2. What are the nutrients provided by cereals?

The nutrients provided by cereals include carbohydrates, proteins, fibres and a wide range of vitamins and minerals.

3. Define pseudo-cereal

The pseudo-cereal is one of any non -grasses that are used in much the same way as cereals.
Example: **quinoa**

4. Mention the uses of Sorghum

- It is fed to poultry, birds, pigs and cattle.
- It is a source of fermented alcoholic beverage.

5. Write the history of foxtail millet (*Setaria italic)*

- One of the oldest millet used traditionally in India.
- It is domesticated first in China about 6000 years.

6. What are edible fruits ?

- Edible fruits are fleshy structures with a pleasant aroma and flavours.
- Fruits are sources of many nutrients including potassium, dietary fibre, folic acid and vitamins.

7. What are classification of edible fruits ?

Edible fruits are classified into temperate (apple, pear, plum) and tropical fruits (mango, jack, banana).

8. What are nuts ?

- Nuts are simple dry fruits composed of a hard shell and an edible kernel.
- They provide healthy fats, fibre, protein, vitamins, minerals and antioxidants.

9. Name the major cultivars of mango in India

The major cultivars of mango in India are Alphonsa, Banganapalli, neelam and malgova.

10. What are the sugars ?

- Sugar is the generic name for sweet tasting soluble carbohydrate, which are used in foods and beverages.
- Sugars found in sugarcane and *Palmyra.*

11. Write origin and area of cultivation cashew nut

- Originated in Brazil and made its way to India in the 16th century through Portuguese sailors.
- Cashew is grown in Kerala, Karnataka, Goa, Maharashtra, Tamil Nadu, and Orissa.

12. How the improve quality of cultivated sugar cane is evolves in india?

- The cultivated *Saccharum officinarum* has evolved by repeated back crossing of *S.officinarum* of New Guinea with wild *S.spontaneum* of India to improve the quality.

13. Write the origin and area of cultivation of palmyra

- It is native to tropical regions of Africa, Asia and New Guinea.
- Palmyra grows all over Tamil Nadu, especially in coastal districts.

14. What are the two kinds of oils?

The two kinds of oils are 1.Essential oils 2.Vegetable oils or fatty oils.

15. What is meant by condiments ?

The condiments, are flavouring substances having a sharp taste and added to food after cooking. Example: curry leaves.

16. Write the important cultivated species of chillies

C.annuum and *C. frutescens* are important cultivated species of chillies.

17. Define cayenne pepper

The long fruit cultivars of *C.frutescens*. *C.annum* are commercially known as 'Cayenne pepper'

18. Write the uses of cotton .

It is mainly used in the manufacturing of various textile, hosiery products, toys and is also used in hospitals.

19. Mention the two cultivated species of jute

The two cultivated species (1) *Corchorus capsularis* and (2) *C.olitorius* is of African origin.

20. Mention the origin and area of cultivation of henna

- It is indigenous to North Africa and South-west Asia.
- It is grown mostly throughout India, especially in Gujarat, Madya Pradesh and Rajasthan

21. What are the vegetable oils or non-volatile oils or fixed oils?

- The vegetable oils or non-volatile oils or fixed oils that do not evaporate.
- Whole seeds or endosperm form the sources of vegetable oils.

Write the origin and area of cultivation *aloe vera*

- It is a native of Sudan.
- It is cultivated on a large scale in Rajasthan, Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu.

22. Turning back to natural products- Justify

- Today, cosmetics have a high commercial value and have become chemical based industrial products.
- In recent years, people have realized the hazards of chemical-based cosmetics and are turning back to natural products.

23. How is wood pulp manufactured? Name the plant wood used for making paper pulp ?

- The wood is converted into pulp by mechanical, and chemical processes.
- The wood of Melia azadirachta, *Neolamarkia chinensis*, *Casuarina* spp, *Eucalyptus* spp are used for making paper pulp.

24. Expand GIRI

- GIRI - Geographical Indication Registry of India

25. What are the origin and area of cultivation of Jasmine?

- *Jasminum grandiflorum*, a native of the north-western Himalayas.
- In Tamil Nadu, the major cultivation centres are Madurai and Thovalai of Kanyakumari District.

26. What are the skin and hair care of southern indian people?

- The southern Indian people using turmeric, green gram powder, henna, sigaikai and usilai for their skin and hair care.
- These were mostly home prepared products that are used for grooming.

27. Describe the scientific prove of extract of *P.amarus*

Scientifically proved that the extract of *P. amarus* is effective against hepatitis B virus by Dr. S P Thyagarajan and his team from University of Madras.

28. Why most of the countries have banned *cannabis* / marijuana cultivation?

- The prolonged use of marijuana causes addiction and has an effect on individual's health and society.
- So most of the countries have banned its cultivation and use.

29. What is entrepreneurial botany ?

The study of how new businesses are created using plant resources are called entrepreneurial botany.

30. Write some of the entrepreneurship activities

Some of the activities of entrepreneurship are Mushroom cultivation, Single cell protein (SCP) production, Seaweed liquid fertilizer, Organic farming, Terrarium, Bonsai and Cultivation of medicinal and aromatic plants

PART – C

ADDITIONAL QUESTIONS (3 MARKS)

1. Write about cereal

- The word cereal is derived from Ceres.
- according to the Roman mythology Ceres denotes "Goddess of agriculture".
- All cereals are members of grass family (Poaceae).
- These are grown for edible starchy seeds.

2. Write about rice /paddy

- Paddy is a semi-aquatic crop and is grown in standing water.
- It is an important food crop of the world, occupying the second position next to wheat.
- Rice is the chief source of carbohydrate.

3. State the origin and area of cultivation of rice

- The center of origin is South East Asia of rice.
- The cultivation have been found in China, India and Thailand.
- It is mainly cultivated in Delta and irrigated regions of Tamil Nadu.

4. State the origin and area of cultivation of wheat

- The cultivation comes from Fertile Crescent region.
- *Triticum aestivum* is cultivated for about 7,500 years.
- Mostly cultivated in Uttar Pradesh, Punjab, Haryana, Rajasthan, Madhya Pradesh and Bihar.

5. Mention the uses of Corn

- Corn is used as fodder than food.
- Corn syrup is used for infant foods.
- Corn is a raw material for alcohol and alcoholic beverages.

6. Write about Sorghum (*Sorghum vulgare*)

- Sorghum is native to Africa.
- One of the major millets in the world.
- It is rich in calcium and iron.

7. Mention the uses of foxtail millet

- Rich in protein, carbohydrate, vitamin B and C, Potassium and Calcium.
- It supports in strengthening of heart and improves eye sight.
- Thinai porridge is given to lactating mother.

8. Describe about pseudo-cereal

- Pseudo-cereal is one of any non -grasses that are used in much the same way as cereals. Example: **quinoa**
- It is actually a seed from the *Chenopodium quinoa* plant belongs to Amaranthaceae.
- It is a gluten-free, whole-grain carbohydrate, and whole protein (contains all nine essential amino acids)
- This have been eaten for 6,000 years in Andes hill region

9. Write the uses of finger millet – Ragi

- Used as a staple food in many southern hilly regions of India.
- Ragi grains are made into porridge and gruel.
- Ragi malt is the popular nutrient drink.
- It is used as a source of fermented beverages.

10. Write the uses of kodo millet

- It is rich in fibre, protein and minerals.
- It is ground into flour and used to make pudding.
- Good diuretic and cures constipation.
- Helps to reduce obesity, blood sugar and blood pressure.

11. Describe about pulses

- Latin words 'puls' or 'pultis' meaning "thick soup".
- Pulses from the fruits of Fabaceae.
- They provide protein, vitamins and minerals.

12. What are the of black gram ?

- It is eaten whole or split, boiled or roasted or ground into flour.
- It is a major ingredients of popular Southern Indian breakfast dishes.
- Split pulse is used in seasoning Indian curries.

13. Describe the uses of red gram / pigeon pea

- It is a major ingredient of sambar, a characteristic dish of Southern India.
- Roasted seeds are consumed either salted or unsalted as a popular snack.
- Young pods are cooked and consumed.

14. Mention the uses of green gram

- It can be used as roasted cooked and sprouted pulse.
- It is one of the ingredients of pongal, a popular breakfast dish in Tamil Nadu.
- Fried dehulled and broken or whole green gram is used as popular snack.
- The flour is traditionally used as a cosmetic, especially for the skin.

15. Why do we need to eat vegetables and what do they provide us?

- It is an important part of healthy eating and provide many nutrients.
- They provide potassium, fibre, folic acid and vitamins A, E and C.
- The nutrients in vegetables are vital for maintenance of our health.

16. Describe the origin and area of cultivation of lady's finger

- It is a native of the Tropical Africa.
- Abundantly grown in Assam, Maharashtra and Gujarat
- Major cultivation in Coimbatore, Dharmapuri and Vellore of tamil nadu.

17. Write the uses of Lady's finger / Okra

- The fresh and green tender fruits are used as a vegetable.
- Often they are sliced and dehydrated to conserve them for later use.
- It has most important nutrients.

18. State origin and area of cultivation of sugarcane

- The cultivated *Saccharum officinarum* has evolved by repeated back crossing of *S.officinarum* of New Guinea with wild *S.spontaneum* of India to improve the quality.
- Sugarcane cultivated in all districts except Kanyakumari and Nilgiris of Tamil Nadu.

19. What are the essential oils or volatile oils ? give examples

- The essential oils or volatile oils which possess aroma evaporate or volatilize in contact with air.
- Any organ of a plant may be the source of essential oil.
- Example: flowers of Jasmine, fruits of orange and roots of ginger.

20. Write the origin and area of cultivation of groundnut / peanut

- It is native of Brazil. Portuguese introduced groundnut into Africa.
- The Spanish took it to the South East Asia and India via Philippines.
- In India Gujarat, Andhra Pradesh and Rajasthan are top producers.

21. Mention the uses of groundnut / peanut

- Nuts contain about 45% oil.
- The kernels are rich sources of phosphorous and vitamins, particularly thiamine, riboflavin and niacin.
- It is premium cooking oil because it does not smoke.
- Lower grade oil is used in manufacture of soaps and lubricants.

22. Write the origin and area of cultivation of Sesame / Gingelly

- It has originated from Africa.
- Sesame is cultivated as a dry land crop.
- West Bengal and Madhya Pradesh are the top producers in India.
- It is considered as a healthy oil in Southern Indian culture.

23. Mention the uses of Sesame / Gingelly

- Sesame oil is used for mostly culinary purposes in India.
- Lower grades are used in manufacture of soaps, in paint industries, as a lubricant and as an illuminant.
- In India, the oil is the basis of most of the scented oils used in perfumes.
- Sesame seed snacks are popular throughout India.

24. State the uses of spices

- Spices are used to improve their palatability.
- Spices are aromatic plant products and are characterized by sweet or bitter taste.
- Spices are added in minimal quantities during the cooking process. Example black pepper.

25. Write the origin and area of cultivation of turmeric

- It is indigenous to Southern Asia.
- India is the largest producer, consumer and exporter of turmeric.
- Erode in Tamil Nadu is the World's largest wholesale turmeric market.

26. Write the origin and area of cultivation of chillies/red Pepper

- It is native to South America.
- It is popularly known as chillies or red pepper in English.
- India is leading producer and exporter.

27. State origin and area of cultivation of mango.

- It is the native to Southern Asia, especially Burma and Eastern India.
- It is the National fruit of India.
- Major mango producing States are Andhra Pradesh, Bihar, Gujarat and Karnataka.
- Salem, Krishnagiri, Dharmapuri are the major mango producing districts of Tamil Nadu.

28. Why does a student or a driver prefer tea or coffee during night work?

- Coffee or tea are the non-alcoholic beverages.
- They contain alkaloids that stimulate central nervous system.
- It also possess mild diuretic properties.

29. Write the origin and area of cultivation of coffee

- It is native to the tropical Ethiopia.
- An Indian Muslim saint, Baba Budan introduced coffee from Yemen to Mysore.
- Karnataka is the largest coffee producing state in India followed by Tamil Nadu and Kerala.
- Tamil Nadu is the largest consumer of coffee in India.

30. Why fried foods are tastier than boiled foods?

- In Fried food, the fat help you enjoy the taste of food because they are able to dissolve and concentrate flavour and odour chemicals .
- These chemicals are released into the air by the heat of cooking .that's why you can taste sizzling bacon even before. So only fried foods are tastier than boiled foods.

31. How about a cup of coffee or tea? We always entertain our guests with this offer ?

- When a cup of coffee or tea is served ,there are a number of things to remember for instance ,despite the small size of the cups ,they will always be offered with two hands and should be accepted in the same way. This is common way of showing respect.

32. Write the history of spices and condiments

- Records of use of garlic and onion dates back 2500 years.
- Majority of the spices are native to Mediterranean region, India and South East Asian countries.
- Spices, especially pepper triggered the search for sea route to India and paved way for the exploratory voyages by Spanish and Portuguese.

33. Mention the uses of tamarind

- It is used in flavouring sauces in the United States and Mexico.
- In India, the fruit pulp is major ingredients for many culinary preparations.
- Sweet tamarinds are sold as table fruits in India imported from Thailand and Malaysia.

34. Write the origin and area of cultivation of cotton.

- It is one of the oldest cultivated crops of the world .
- It has been cultivated for about 8000 years both in new world and in old world.
- In India cotton is cultivated in Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu.

35. What are the uses of purified dissolving pulp ?

- Purified dissolving pulp is used as a basic material in the manufacture of rayon or artificial silk, fabrics, transparent films (cellophane, cellulose acetate films), plastics.
- The viscose process of making rayon is the most common process.

36. Mention the origin and area of cultivation of jute.

- The two cultivated species (1) *Corchorus capsularis* and (2) *C.olitorius* is of African origin.
- *C.capsularis,* is believed to be Indo-Burmese origin.
- It is an important cultivated commercial crop in Gangetic plains of India and Bangladesh.

37. Write the four cotton species of commercial cotton.

- Commercial cotton comes from four cotton species:
- Two from the new world and two from the old world.
- *G.hirsutum* (2) *G.barbadense* are the New world species
- *G.arboretum* (4) *G. herbaceum* are the old world species.

38. Write the origin and area of cultivation of teak

- This is native to South east Asia.
- It is observed wild in Assam.
- But cultivated in Bengal, Assam, Kerala, Tamil Nadu and North-West India.

39. What are the origin and area of cultivation of rubber?

- It is a native of Brazil .It is an important cash crop.
- Asia contributed 90% of the world production.
- Kerala is the largest producer in India followed by Tamil Nadu.

40. Name the different parts of which found the plants. Give the examples .

- The essential oils are found at different parts of the plant are
- leaves, (curry leaf, mint),
- flowers (rose, jasmine),
- fruits (citrus, straw berry) and
- wood (sandal, eucalyptus).

41. Write origin and area of cultivation *keezhanelli.*

- It is a native of Tropical American region .
- It is naturalised in India and other tropical countries.
- It is not cultivated and is collected from moist places in plains.

- *Phyllanthus maderspatensis* is sold in markets collected from non-forest.

42. What is NCB ?

- It is a Narcotics Control Bureau.
- It is the nodal drug law enforcement and intelligence agency of India
- It is responsible for fighting drug trafficking and the abuse of illegal substances.

PART – D

ADDITIONAL QUESTIONS (5 MARKS)

1. Write the importance of cereals as food plants.

- Greater adaptability and successful colonisation on every type of habitat.
- The relative ease of cultivation
- Tillering property that produce more branches .
- It results in higher yield per unit area.
- Compact and dry grains that they can be easily handled, transported and stored without undergoing spoilage.
- High caloric value that provides energy.

2. Mention the uses of wheat

- Wheat is the staple food in Northern India.
- Wheat flour is suitable to make bread and other bakery products.
- Processed wheat flour, that has little fibre, is called Maida.
- It is used in making parota, naan and bakery products.
- Malted wheat is for producing alcoholic beverages and nutritive drinks.

3. State the origin and area of cultivation of black gram

- It is native to India.
- Archeobotanical evidences record of black gram about 3,500 years ago.
- It is cultivated as a rain fed crop in drier parts of India.
- 80% of the global production of black gram in India.
- Important states growing in India are Uttar Pradesh, Chattisgarh and Karnataka.

4. Write the uses of mango

- The major stable fruit of India
- It is rich in beta carotenes.
- It is utilized as dessert, canned, dried and preserves in Indian cuisine.
- Sour, unripe mangoes are used in chutneys, pickles, side dishes,
- Mango pulp is made into jelly.
- Aerated and non-aerated fruit juice is a popular soft drink.

5. Discuss the uses of sugar cane.

- It is the raw material for extracting white sugar.
- Sugarcane supports large number of industries.
- Sugar mills producing refined sugars,
- Distilleries producing liquor grade ethanol
- Millions of jaggery manufacturing units.
- Fresh sugarcane juice is a refreshing drink.
- Molasses is the raw material for the production of ethyl alcohol.

6. Discuss the uses of Palmyra

- Exudate from inflorescence axis is collected for preparing palm sugar.
- Inflorescence is tapped for its sap which is used as health drink.
- Sap is processed to get palm jaggery or fermented to give **toddy**.
- Endosperm is used as a refreshing summer food.
- Germinated seeds have an elongated embryo surrounded by fleshy scale leaf which is edible.

7. Discuss the uses of chillies / red pepper

- The fruits of *C.annuum* are less pungent than *C.frutescens*. *C.annum* includes large, sweet bell peppers.
- Long fruit cultivars of this species are commercially known as 'Cayenne pepper'.
- These are crushed, powdered and used as condiment.
- Chillies are used in manufacture of sauces, curry powders and preparation of pickles.
- Capsaicin is an active component of chillies.
- It has pain relieving properties and used in pain relieving balms.
- Chillies are a good source of Vitamin C, A and E.

8. What you knoe about Scoville Heat Units (SHU) ?

- Capsaicin is responsible for the pungency or spicy taste of chillies.
- Pungency of Chillies is measured in Scoville Heat Units (SHU).
- World's hottest chilli, Carolina reaper pepper measures 2,200,000 SHU.
- Naga viper chilli is the hottest in India that measures 1,349,000 SHU.
- Commonly used cayenne pepper measures 30,000 to 50,000 SHU.

9. Write the origin and area of cultivation tamarind

- It is native of tropical African region.
- It was introduced into India several thousand years before.
- It is cultivated in India, Myanmar, south asian countries and several African and Central American countries. Tamarind has long been used in Africa and in Southern Asia.
- The name tamarindus is of Arabian origin, which means "dates of India". (tamar – dates; Indus – India).

10. Discuss the uses of jute

- It is one of the largest exported fibre material of India.
- The jute industry occupies an important place in the national economy of India.
- Jute is used for 'safe' packaging of natural, renewable, bio-degradable and eco-friendly product.
- It is used in bagging and wrapping textile.
- About 75% of the jute produced is used for manufacturing sacks and bags.
- It is also used in manufacture of blankets, rags, curtains etc.
- It is also being used as a textile fibre in recent years.

11. Mention the uses of teak

- It is one of best timbers of the world.
- The heartwood is golden yellow to golden brown when freshly sawn, turning darker when exposed to light.Known for its durability as it is immune to the attack of termites and fungi.
- The wood does not split or crack and is a carpenter friendly wood.
- It was the chief railway carriage and wagon wood in India.
- Ship building and bridge-building depends on teakwood.
- It is also used in making boats, toys, plywood, door frames and doors.

12. Mention the uses of rubber

- Tyre and other automobile parts manufacturing industries consume 70% of the rubber production.
- Rubber is used in manufacturing footwear, wire and cable insulations, rain-coats, household and hospital goods, shock absorbers, belts, sports goods, erasers, adhesives, and rubber-bands.
- Hard rubber is used in the electrical and radio engineering industries.
- Concentrated latex is used for making gloves, balloons and condoms.
- Foamed latex is used in the manufacture of cushions, pillows and life-belts

13. Describe rubber – vulcanization

- Charles Goodyear invented vulcanization in 1839.
- The defects in rubber articles could be overcome by heating rubber with sulphur under pressure at 1500 C.
- The process was called vulcanization.
- The name was given from the Roman God of Fire, Vulcan.
- Because of this, solid rubber tyres were used for first time in 1867.
- That is why we smoothly travel on road.

14. Describe pulp wood

- The term paper is derived from the word 'papyrus' a plant (*Cyperus papyrus*).
- It was used by Egyptians to make paper-like materials.
- Paper production is a Chinese invention.
- The Chinese discovered the paper from the inner bark of paper mulberry in 105 A.D.
- The art of paper making remained a monopoly of the Chinese until Arabs learned the technique.
- Invention of printing increased the demand for paper.

15. Describe about the dyes

- The ability to perceive colour is a wonderful aspect of human eyes.
- The dyes add colour to the goods we use.
- They have been in use since the ancient times.
- The earliest authentic records of dyeing were found in the tomb painting of ancient Egypt.
- Colourings on mummy cements (wrapping) included saffron and indigo.
- They can also be seen in rock paintings in India.

16. Write the uses of henna.

- An orange dye 'Henna' is obtained from the leaves and young shoots of *Lawsonia inermis.*
- The principal colouring matter of leaves 'lacosone" is harmless and causes no irritation to the skin.
- This dye has long been used to dye skin, hair and finger nails.
- It is used for colouring leather, for the tails of horses and in hair - dyes.

17. What is the meaning of perfume? From which the word is derived .What is the usage in early days ?

- The word **perfume** is derived from the Latin word **Per** (through) and **fumus** (to smoke), meaning **through smoke**.
- It refers to the age-old tradition of burning scented woods at religious ceremonies.
- In early days, when people were less conscious of personal hygiene.
- Essential oils not only masked offensive odours, but also may have acted as antiseptics.
- Perfumes are added to baths and used for anointing the body.
- Perfumes are manufactured from essential oil which are **volatile** and **aromatic**.

18. Discuss madurai malli

- 'Madurai Malli' is the pride of Madurai.
- It has been given the Geographical Indications (GI)mark by the Geographical indication Registry of India.
- Madurai malli has thick petals with long stalk equal to that of petals.
- The distinct fragrance is due to the presence of chemicals such as jasmine and alpha terpineol.
- This is the second GI tag for Jasmine after 'Mysore Malli'.

19. Discuss the ayurveda system of medicine

- Ayurveda supposed to have originated from Brahma.
- The core knowledge is documented by **Charaka, Sushruta** and **Vagbhata.**.
- Vatha, Pitha and Kapha which would exist in equilibrium for a healthy living.
- This system Uses more of herbs and few animal parts as drug sources.
- Plant sources include a good proportion of Himalayan plants.
- The **Ayurvedic Pharmacopoeia** of India lists about 500 plants used as source of drugs.

20. Write about the folk system of medicine

- Folk systems survive as an oral tradition among innumerable rural and tribal communities of India.
- A consolidated study to document the plants used by ethnic communities was launched by the Ministry of Environment and Forests, Government of India in the form of All India Coordinated Research Project on Ethnobiology.
- As a result about 8000 plant species have been documented which are used for medicinal purposes.
- The efforts to document in several under-explored and unexplored pockets of India still continue.
- Major tribal communities in Tamil Nadu who are known for their medicinal knowledge include **Irulas, Malayalis, Kurumbas, Paliyans** and **Kaanis**.

21. Tabulate the common medicinal plants.

Other common medicinal plants

S. No	Common Name	Tamil Name	Botanical Name	Family	part used	Medicinal Uses
1	Holy basil	துளசி	*Ocimum sanctum*	Lamiaceae	Leaves and Roots	• The leaves are stimulant, antiseptic, anti hypertensive and anti-bacterial and expectorant used in bronchitis. • Decoction of roots is given as a diaphoretic in malarial fever.

2	Indian gooseberry	நெல்லி	*Phyllanthus emblica*	Phyllanthaceae	Fruit	• It is a potent rejuvenator and immune modulator. • It has a anti-ageing properties. • It helps to promote longevity, enhance digestion, treat constipation and reduce fever and cough.
3	Indian Acalypha	குப்பை மேனி	*Acalypha indica*	Euphorbiaceae	Leaves	• Used to cure skin diseases caused by ringworms. Powdered leaves are used to cure bedsores and infected wounds.
4	Vilvam	வில்வம்	*Aegle marmelos*	Rutaceae	Fruit	• The unripe fruit is used to treat problems of stomach indigestion. • It kills intestinal parasites.
5	Veldt grape	பிரண்டை	*Cissus quadrangularis*	Vitaceae	Stem and root	• Paste obtained from the powdered stem and root of this plant is used in bone fractures. • Whole plant is useful to treat asthma and stomach troubles.

22.Describe NCB

- Drugs come in various forms and can be taken in numerous ways.
- Some are legal and others are not.
- Drug abuse and misuse can cause numerous health problems and in serious cases death can occur.
- The Narcotics Control Bureau (NCB) is the nodal drug law enforcement and intelligence agency of India
- It is responsible for fighting drug trafficking and the abuse of illegal substances.

23. Organic pesticide safe for human and the environment. Give reason in support of your answer.

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

24. How to prepare the bio-pest repellent.Explain the steps ?

- Botanical pest repellent and insecticide made with the dried leaves of *Azadirachta indica*
- Pluck leaves from the neem tree and chop the leaves finely.
- The chopped up leaves were put in a 50-liter container
- Fill to half with water; put the lid on and leave it for 3 days to brew.
- Using another container, strain the mixture which has brewed for 3 days to remove the leaves, through fine mesh sieve.
- The filtrate can be sprayed on the plants to repel pests.

25. What are the precaution taking while using biopesticide?

- Avoid spraying the plants during the sunny times of the day since it could burn plants.
- Many other plants possess insect repellent or insecticidal properties.
- Combinations of these plants can be fermented and used as biopesticide.
- To make sure that the pest repellent sticks to the plants, add 100 ml of cooking oil and the same amount of soap water.
- (The role of the soap water is to break down the oil, and the role of the oil is to make it stick to the leaves).
- The stewed leaves from the mixture can be used in the compost heap or around the base of the plants.

BIOLOGY MODEL QUESTION PAPER-2019
HIGHER SECONDARY (SECOND YEAR)

PART – I

(BIO - BOTANY)

Time allowed: 1:15 Hours] [Maximum Marks: 35

Instrucitons:

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use Blue or Black ink to write and underline and pencil to draw the diagrams.

SECTION – I

I. NOTE: 8 x 1 = 8

(i) Answer all the questions.

(ii) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

1. Match the items in Column-I with those in Column-II and choose the correct answer

Column -I	Column - II
A. Funicle	**i.** Small opening of ovule
B. Integuments	**ii.** Stalk of ovule
C. Chalaza	**iii.** Protective envelopes of ovules
D. Hilum	**iv.** Junction part of ovule
E. Micropyle	**v.** Basal part of the ovule

a) A -ii; B - iii; C - v; D - iv; E - i

b) A -i; B -iii; C - ii; D - iv; E - v

c) A -ii; B - iii; C - i; D - iv; E - v

d) A -ii; B - iv; C - v; D - i; E - iii

2. Independent assortment of genes does not take place when

a) genes are located on non homologous chromosomes

b) genes are located on homologous chromosomes

c) all the above

d) genes are linked and located on same chromosomes

3. The A and B genes are 10 cM apart on a chromosome. If an AB/ab heterozygote is testcrossed to ab/ab, how many of each progeny class would you expect out of 100 total progeny?

a) 25 AB, 25 ab, 25 Ab, 25 aB

b) 10 AB, 10 ab

c) 45 AB, 45 ab

d) 45 AB, 45 ab, 5 Ab, 5aB

4. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?

a)	5'.....GAATTC.....3'	3'.....CTTAAG.....5'
b)	5'.....CGTTCG.....3'	3'.....ATGGTA.....5'
c)	5'.....CACGTA.....3'	3'.....CTCAGT.....5'
d)	5'.....GATATG.....3'	3'.....CTACTA.....5'

5. Select the correct statement(s) from given statement

i. The cultures are incubated in continuous light 1000 – 2000 lux at 25°C

ii. Secondary metabolites are required for normal growth

iii. The culture of single cell in vitro in liquid medium is called suspension culture

iv. Bio synthesis and isolation of indole alkaloids from *Catharanthus roseus*.

a) i, ii and iii. are correct

b) i. and ii. only correct

c) i, iii and iv. are correct

d) ii, iii and iv. are correct

6. 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

Codes

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

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

c) If Assertion is true but Reason is false.

d) If both Assertion and Reason are false.

7. Assertion : The pyramid of biomass indicates the decrease in biomass at each trophic level from base to apex.

Reason : Parasites have inverted pyramid for biomass.

8. Pick out the odd pair.

a) Mass selection - Morphological characters

b) Purline selection - Repeated self pollination

c) Clonal selection - Sexually propagated

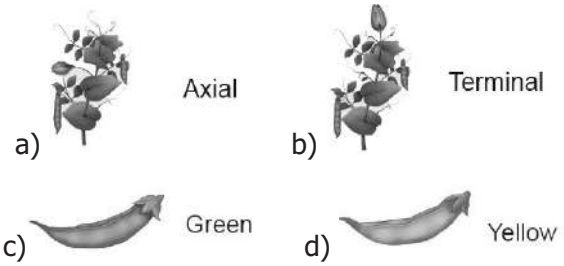
d) Natural selection - Involves nature

SECTION - II

II. Answer any four of the following not exceeding 30 words. 4 x 2 = 8

9. What is an autogamy. In what type of flowers it is possible.

10. Observe carefully the given diagrams and characters. Identify a,b,c and d which is dominant and recessive



11. Name the chemicals used in gene transfer.

12. What is ozone hole?

13. What is pseudo cereal? Give an example

14. What is Azolla? Write their use.

SECTION - III

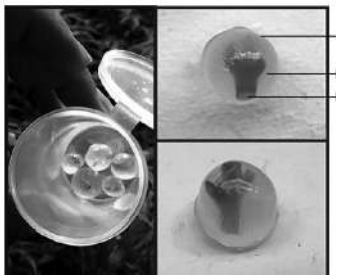
III. Answer any three of the following not exceeding 45 words.

Question No. 18 is compulsory. 3 x 3 = 9

15. Which is called as the "King of Bitters"? Mention any two medicinal importance.

16. 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.

17. Observe the given diagram is artificial seeds. Label the parts a, b and c



18. Enumerate the causes of deforestation

19. What is monosomy and add note on double and triple monosomy.

SECTION - IV

IV. Answer all the following not exceeding 75 words. 2 x 5 = 10

20. Give reason for each of the following.

a. Anthers of angiosperm flowers are described as dithecus.

b. pollen grains are well preserved as fossils.

(or)

Explain the mechanism of crossing over.

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

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

(or)

a. What is co evolution?

b. Write the significance of food web