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BIOLOGY

BIO BOTANY &

BIO ZOOLOGY

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BIO BOTANY

UNIT 1 A SEXUAL AND SEXUAL REPRODUCTION IN PLANTS

1. Choose the correct statement from the following

a) Gametes are involved in asexual reproduction b) Bacteria reproduce asexually by budding

c) Conidia formation is a method of sexual reproduction **d) Yeast reproduce by budding**

2. An eminent Indian embryologist is

a) S.R.Kashyap **b) P.Maheswari** c) M.S. Swaminathan d) K.C.Mehta

3. Identify the correctly matched pair

a) Tuber - Allium cepa

b) Sucker - Pistia

c) Rhizome - Musa

d) Stolon - Zingiber

4. Pollen tube was discovered by

a) J.G.Kolreuter **b) G.B.Amici** c) E.Strasburger d) E.Hanning

5. Size of pollen grain in Myosotis (Mar24)

a) 10 micrometer b) 20 micrometer c) 200 micrometer d) 2000 micrometer

6. First cell of male gametophyte in angiosperm is (May22)

a) Microspore b) megaspore c) Nucleus d) Primary Endosperm Nucleus

7. Match the following

I) External fertilization	i) pollen grain
II) Androecium	ii)anther wall
III) Male gametophyte	iii)algae
IV) Primary parietal layer	iv)stamens

a)I-iv;II-i;III-ii;IV-iii **b)I-iii;II-iv;III-i;IV-ii** c)I-iii;II-iv;III-ii,IV-i d)I-iii;II-i;III-iv;IV-ii

8. Arrange the layers of anther wall from locus to periphery

a) Epidermis,middle layers, tapetum, endothecium b) Tapetum, middle layers, epidermis, endothecium

c) Endothecium, epidermis, middle layers, tapetum **d) Tapetum, middle layers endothecium epidermis**

9. Identify the incorrect pair

a) sporopollenin - exine of pollen grain

b) tapetum - nutritive tissue for developing microspores

c) Nucellus - nutritive tissue for developing embryo

d) obturator - directs the pollen tube into micropyle

10. Assertion : Sporopollenin preserves pollen in fossil deposits

Reason : Sporopollenin is resistant to physical and biological decomposition

a) assertion is true; reason is false b) assertion is false; reason is true

c) Both Assertion and reason are not true **d) Both Assertion and reason are true.**

11. Choose the correct statement(s) about tenuinucellate ovule

a) Sporogenous cell is hypodermal b) Ovules have fairly large nucellus

c) sporogenous cell is epidermal **d) ovules have single layer of nucellus tissue**

12. Which of the following represent megagametophyte (Mar23)

a) Ovule **b)Embryo sac** c)Nucellus d)Endosperm

13. In Haplopappus gracilis, number of chromosomes in cells of nucellus is 4. What will be the chromosome number in Primary endosperm cell?

a)8 b)12 **c)6** d)2

14. Transmitting tissue is found in

a) Micropylar region of ovule b) Pollen tube wall

c) Stylar region of gynoecium d) Integument

15. The scar left by funiculus in the seed is (June22)

a)tegmen b)radicle c)epicotyl **d)hilum**

16. A Plant called X possesses small flower with reduced perianth and versatile anther. The probable agent for pollination would be

a)water **b)air** c)butterflies d)beetles

17. Consider the following statement(s)

i) In Protandrous flowers pistil matures earlier

ii) In Protogynous flowers pistil matures earlier

iii) Herkogamy is noticed in unisexual flowers

iv) Distyly is present in Primula

a) i and ii are correct **b) ii and iv are correct** c) ii and iii are correct d) i and iv are correct

18. Coelorhiza is found in (Aug22)

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

19. Parthenocarpic fruits lack (Aug21)

a)Endocarp b)Epicarp c)Mesocarp **d) seed**

20. In majority of plants pollen is liberated at

a) 1 celled stage **b) 2 celled stage** c) 3 celled stage d) 4 celled stage

21. What is reproduction?

- It is a process which helps an organism to perpetuate its own species.
- It can be classified into a sexual and sexual reproduction.

22. Mention the contribution of Hofmeister towards Embryology.

- 1848 - Hofmeister described the structure of pollen tetrad.

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

- Runner – *Centella asiatica*
- Stolon – *Fragaria and Mentha.*

24. What is layering?

- In this method, the stem of a parent plant is allowed to develop roots while still intact.
- When the root develops, the rooted part is cut and planted to grow as a new plant. Examples: *Ixora and Jasminum.*

25. What are clones?

- Cloning is the process of producing genetically identical individuals of an organism either naturally or artificially.

26. A detached leaf of Bryophyllum produces new plants. How?

- Adventitious buds develop in notches in the leaf margins. These are epiphyllous buds, from which the new plants develop.

27. Differentiate Grafting and Layering. (Mar23)

Grafting	Layering
Parts of two different plants are joined so that they continue to grow as one plant.	In this method, the stem of a parent plant is allowed to develop roots while still intact. Examples: *Ixora and Jasminum.*

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

- Tissue culture is the growth of tissue or cell in an artificial medium separate from the organism.
- Rare and endangered plants can be propagated.

29. Distinguish mound layering and air layering.

Mound Layering	Air layering
In this method the lower branch with leaves is bent to the ground and part of the stem is buried in the soil and tip of the branch is exposed above the soil	In this method the stem is girdled at nodal region and hormones are applied to this region which promotes rooting.

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

Conventional methods:

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

Cutting:

- It is the method of producing a new plant by cutting the plant parts such as root, stem and leaf from the parent plant.
- The cut part is placed in a suitable medium for growth.
- Stem cutting is widely used for propagation.

Layering:

- In this method, the stem of a parent plant is allowed to develop roots while still intact.
- When the root develops, the rooted part is cut and planted to grow as a new plant. Examples: *Ixora and Jasminum*

31. What is Cantharophily.

- The cross pollination of flowers by beetles is called cantharophily.
- The beetles feed the pollen or on some of the juicy tissues of the flowers.

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

- **Protandry :** The stamens mature earlier than the stigmas of the flowers. Examples: *Helianthus, Clerodendrum.*
- **Protogyny :** The stigmas mature earlier than the stamens of the flower. Examples: Scrophularia nodosa

33. What is endothelium / integumentary tapetum?

- In some species the inner layer of integument may become specialized to perform nutritive function for the embryosac and is called endothelium. Example : Asteraceae.

34. "The endosperm of angiosperm is different from gymnosperm". Do you agree. Justify your answer.

Endosperm of Angiosperm	Endosperm of Gymnosperm
It is formed after fertilization.	It is formed before fertilization.
It is a triploid tissue.	It is a haploid tissue.
The function is to nourish the developing embryo.	It acts as the female gametophyte and later acts as nutritive tissue.

35. Define the term Diplospory.

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

36. What is polyembryony. How it can commercially exploited. (Sep20)

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

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

- As mature, fertilized embryo sac offers very little nourishment to the zygote, the primary endosperm cell (PEC) divides and generates the endosperm tissue which nourishes the zygote.

38. What is Mellitophily? (May22)

- Pollination of flowers by bees is known as mellitophily.

39. "Endothecium is associated with dehiscence of anther" Justify the statement.

- Endothecium is a single layer of radially elongated cells below the epidermis of anther wall.
- **In the cells along the junction of two sporangia, the thickenings are absent and this region is called stomium.(March 2023)**
- This along with the hygroscopic nature of endothecium helps in the dehiscence of anther at maturity.

40. List out the functions of tapetum. (May22, June22)

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

41. Write short note on Pollen kitt. (June23)

- The pollen kitt material is contributed by tapetal cells and made of carotenoids or flavonoids. (Orange or Yellow).
- It attracts insects and protects damage from UV radiation.

42. Distinguish tenuinucellate and crassinucellate ovules.

Tenuinucellate type	Crassinucellate type
Sporogenous cell is hypodermal with a single layer of nuclear tissue around in the ovule.	Ovules with subhypodermal sporogenous cell are described as crassinucellate.

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

Gymnosperms – Pollination	Angiosperms - Pollination
Direct pollination is seen	Indirect pollination is seen
Pollination is by anemophilous mode.	Pollination can be self pollination or cross pollination.

44. Write short note on Heterostyly.

- Some plants produce two or three different forms of flowers that are different in their length of stamens and style.

Distyly:

- The plant produces two forms of flowers, Pin or long style, long stigmatic papillae, short stamens and small pollen grains; Example: *Primula*

Tristyly:

- The plant produces three kinds of flowers, with respect to the length of the style and stamens. *E.g: Lythrum.*

45. Enumerate the characteristic features of Entomophilous flowers.

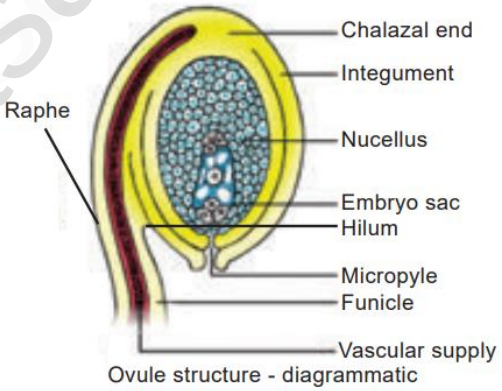
- Flowers are generally large or if small they are aggregated in dense inflorescence. Example: *Asteraceae* flowers.
- Flowers are brightly coloured. For example in ***Poinsettia***
- Flowers are scented and produce nectar.
- Flowers in which there is no secretion of nectar, the pollen is either consumed as food or used in building up of its hive by the honeybees.
- Pollen and nectar are the floral rewards for the visitors.
- Flowers pollinated by flies and beetles produce foul odour to attract pollinators.

- In some flowers juicy cells are present which are pierced and the contents are sucked by the insects.

46. Discuss the steps involved in Microsporogenesis. (Mar24)

- The stages involved in the formation of haploid microspores from diploid microspore mother cell through meiosis is called **Microsporogenesis.**
- The last generation of sporogenous tissue functions as microspore mother cells.
- Each microspores divided into four haploid microspore cells.
- The microspore tetrad may be arranged in a tetrahedral, decussate, linear, T shaped or isobilateral manner.
- Microspores soon separate from one another and remain free in the anther locule and develop into pollen grains.
- In some plants, all the microspores in a microsporangium remain held together called pollinium. Example: *Calotropis*.
- Compound pollen grains are found in *Drosera* and *Drymis.*

47. With a suitable diagram explain the structure of an ovule.



Ovule structure - diagrammatic

- The nucellus is enveloped by one or two protective coverings called integuments
- Hilum is represents the junction between ovule and funicle.
- In an inverted ovule, the funicle is adnate to the body of the ovule forming a ridge called raphe.
- Nucellus is a parenchymatous tissue reserve food.
- Inner layer perfrom nutritive function for the embryo sac and is called as endothelium or integumentary tapetum (Example : Asteraceae)
- There are two types of ovule based on the position of the sporogenous cell.
- **Tenuinucellate type** – sporogenous cell is hypodermal with a single layer of nucellar tissue. It has very small nucellus.
- **Crassinucellate type** - Ovules with subhypodermal sporogenous cell. It has large nucellus.

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

- Germination of pollen grain on stigma.
- Formation of pollen tube in stigma.
- Growth of pollen tube inside the style.
- Direction of pollen tube towards the micropyle of ovule.
- Entry of pollen tube into the synergid of embryo sac.
- Discharge of male gamete from the pollen tube.
- Fusion of male gamete with egg cell (syngamy)
- Fusion of second male gamete with polar nuclei (triple fusion).

49. What is endosperm. Explain the types.

- Endosperm is a tissue produced inside the seeds of most of the flowering plants following fertilization. It surrounds the embryo and provides nutrition.
- Three types of endosperm in angiosperms.
- 1. Nuclear endosperm, 2. Cellular endosperm and 3.helobial endosperm.

Nuclear endosperm:

- Primary Endosperm Nucleus undergoes several mitotic divisions without cell wall formation.
- Thus a free nuclear condition exists in the endosperm. Examples: Coccinia , Capsella and Arachis

Cellular endosperm:

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

Helobial endosperm:

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

50. Differentiate the structure of Dicot and Monocot seed.

Dicot Seed	Monocot Seed
Two cotyledons in the embryo	One cotyledons in the embryo
Plumule is terminal, cotyledons are lateral	Plumule is lateral, cotyledons are terminal
Albuminous and ex albuminous	Mostly albuminous
Germination usually epigeal	Germination usually hypogeal

51. Give a detailed account on parthenocarpy. Add a note on its significance. (May2022)

- Process of Development of fruit without fertilization called parthenocarpy.
- They do not have true seeds. E.g: Banana, Papaya and Grapes.

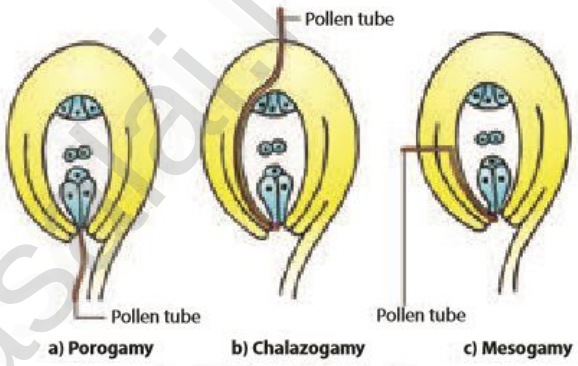
Significance:

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

ADDITIONAL QUESTIONS:

1. Write a note on entry of pollen tube into the ovule. (Mar-2020)

- There are three types of pollen tube entry into the ovule
- **Porogamy:** when the pollen tube enters through the micropyle.
- **Chalazogamy:** when the pollen tube enters through the chalaza.
- **Mesogamy:** when the pollen tube enters through the integument.



2. Write down the advantages of conventional methods of layering?

- The plants produced are genetically uniform.
- Many plants can be produced quickly by this method.
- Plants can be produced in a short period by this method.

3. Write down the advantages of modern methods of layering?

- Plants with desired characteristics can be multiplied rapidly in a short duration.
- Plants produced are genetically identical.
- Rare and endangered plants can be propagated.

4. Explain different types of ovules.

Orthotropous:

- The micropyle is at the distal end.
- The funicle and the chalaza lie in one straight vertical line. Examples: Piperaceae, Polygonaceae

Anatropous:

- The micropyle and funiculus come to lie very close to each other.

- This is the common type of ovules found in dicots and monocots.

Hemianatropous:

- The body of the ovule is placed transversely and at right angles to the funicle. Example: Primulaceae. Example: Primulaceae.

Campylotropous:

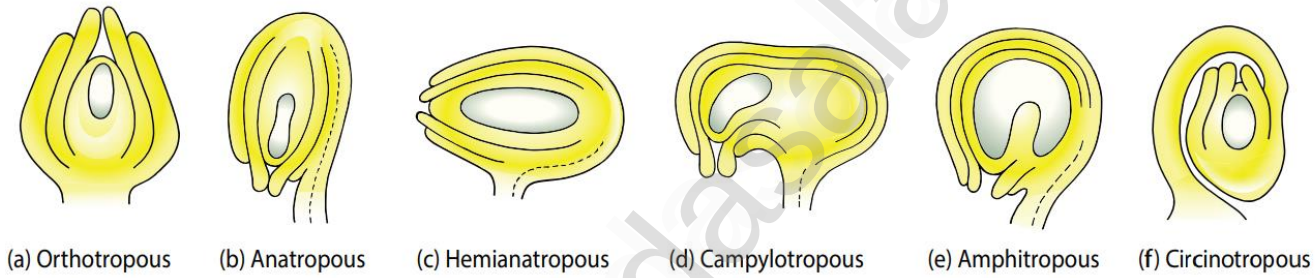
- The micropylar end is curved and more or less bean shaped.
- All the three, hilum, micropyle and chalaza are adjacent to one another, with the micropyle oriented towards the placenta. Example: Leguminosae

Amphitropous:

- The distance between hilum and chalaza is less. The curvature of the ovule leads to horse-shoe shaped nucellus. Example: some Alismataceae.

Circinotropous:

- Funiculus is very long and surrounds the ovule. Example: Cactaceae



5. Define megasporogenesis.

- The process of development of a megaspore from a megaspore mother cell is called megasporogenesis.

6. Define monosporic, bisporic and tetrasporic.

Monosporic:

- The functional megaspore forms the female gametophyte or embryo sac.
- This type of development is called monosporic development (Example: Polygonum).

Bisporic:

- The four megaspores formed if two are involved in Embryo sac formation the development is called bisporic (Example: Allium).

Tetrasporic:

- If all the four megaspores are involved in Embryo sac formation the development is called tetrasporic (Example: Peperomia).

7. Define pollination.

- This process of transfer of pollen grains from the anther to a stigma of a flower is called pollination.

8. What is anemophily and write its characteristic features. (Mar23)

- Pollination by wind. The wind pollinated flowers are called anemophilous.
- The perianth is absent or highly reduced.
- The flowers are small, colourless, not scented.
- The stamens are numerous.
- Plant produces flowers before the new leaves appear.

9. What is ornithophily and write its characteristic features.

- Pollination by birds is called Ornithophily.
- The flowers are usually large in size.
- The flowers are brightly coloured.
- The flowers are scentless but produce nectar.
- The flowers are tubular, cup shaped or urnshaped.

10. What is entemophily and write its characteristic features.

- Pollination by insects is called Entomophily. Pollination by ant is called myrmecophily.
- Flowers are brightly coloured.
- Flowers are scented and produce nectar.
- Flowers are generally large or if small they are aggregated in dense inflorescence.

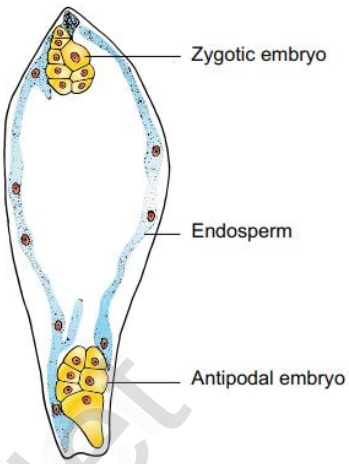
11. Define apomixis and write down its types.

- Wherever reproduction does not involve union of male and female gametes is called apomixis.
- The term Apomixis was introduced by Winkler in the year 1908.
- Maheswari (1950) classified Apomixis into two types - Recurrent and Non recurrent
- **Recurrent apomixes** **:** It includes vegetative reproduction and agamospermy
- **Non recurrent apomixes:** Haploid embryo sac developed after meiosis, develops into a embryo without fertilization.

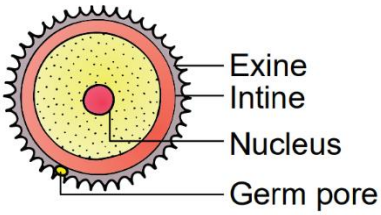
12. Define polyembryony.

- Occurrence of more than one embryo in a seed is called polyembryony.
- The first case of polyembryony was reported in certain oranges by Anton van Leeuwenhoek in the year 1719.
- a. Cleavage polyembryony (Example: Orchids)

- b. Formation of embryo by cells of the Embryo sac other than egg (Synergids – Aristolochia; antipodals – Ulmus and endosperm – Balanophora)
- c. Development of more than one Embryo sac within the same ovule. (Derivatives of same MMC, derivatives of two or more MMC – Casuarina)
- d. Activation of some sporophytic cells of the ovule (Nucellus/ integuments-Citrus and Syzygium).



13. Draw the structure of male gamete microspore. (Sep20)



LESSON 2 CLASSICAL GENETICS

1. Extra nuclear inheritance is a consequence of presence of genes in (June23)

a) Mitrochondria and chloroplasts b) Endoplasmic reticulum and mitrochondria

c) Ribosomes and chloroplast d) Lysososmes and ribosomes

2. In order to find out the different types of gametes produced by a pea plant having the genotype AaBb, it should be crossed to a plant with the genotype

a) aaBB b) AaBB c) AABB **d) aabb**

3. How many different kinds of gametes will be produced by a plant having the genotype AABbCC?

a) Three **b) Four** c) Nine d) Two

4. Which one of the following is an example of polygenic inheritance?

a) Flower colour in Mirabilis Jalapa b) Production of male honey bee

c) Pod shape in garden pea **d) Skin Colour in humans**

5. In Mendel's experiments with garden pea, round seed shape (RR) was dominant over wrinkled seeds (rr), yellow cotyledon (YY) was dominant over green cotyledon (yy). What are the expected phenotypes in the F2 generation of the cross RRYY x rryy? (Aug21)

a) Only round seeds with green cotyledons b) Only wrinkled seeds with yellow cotyledons

c) Only wrinkled seeds with green cotyledons

d) Round seeds with yellow cotyledons an wrinkled seeds with yellow cotyledons

6. Test cross involves

a) Crossing between two genotypes with recessive trait b) Crossing between two F1 hybrids

c) Crossing the F1 hybrid with a double recessive genotype

d) Crossing between two genotypes with dominant trait

7. In pea plants, yellow seeds are dominant to green. If a heterozygous yellow seed pant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in F1 generation?

a) 9:1 b) 1:3 b) 3:1 **d) 50:50**

8. The genotype of a plant showing the dominant phenotype can be determined by

a) Back cross b) Test cross c) Dihybrid corss d) Pedigree analysis

9. Select the correct statement from the ones given below with respect to dihydrid cross

a) Tightly linked genes on the same chromosomes show very few combinations

b) Tightly linked genes on the same chromosomes show higher combinations

c) Genes far apart on the same chromosomes show very few recombinations

d) Genes loosely linked on the same chromosomes show similar recombinations as the tightly linked ones

10. Which Mendelian idea is depicted by a cross in which the F1 generation resembles both the parents

a) Incomplete dominance b) Law of dominance

c) Inheritance of one gene **d) Co-dominance**

11. Fruit colour in squash is an example of (Mar24)

a) Recessive epistatsis **b) Dominant epistasis**

c) Complementary genes d) Inhibitory genes

12. In his classic experiments on Pea plants, Mendel did not use

a)Flowering position b) Seed colour **c) Pod length** d) Seed shape

13. The epistatic effect, in which the dihybrid cross 9:3:3:1 between AaBb Aabb is modified as

a) Dominance of one allele on another allele of both loci

b) Interaction between two alleles of different loci

c) Dominance of one allele to another alleles of same loci

d) Interaction between two alleles of some loci

14. In a test cross involving F1 dihybrid flies, more parental type offspring were produced than the recombination type offspring. This indicates

a) The two genes are located on two different chromosomes

b) Chromosomes failed to separate during meiosis

c) The two genes are linked and present on the some chromosome

d) Both of the characters are controlled by more than one gene

15. The genes controlling the seven pea characters studied by Mendel are known to be located on how many different chromosomes?

a) Seven b) Six c) Five **d) Four**

16. Which of the following explains how progeny can posses the combinations of traits that none of the parent possessed?

a) Law of segregation b) Chromosome theory

c) Law of independent assortment d) Polygenic inheritance

17. "Gametes are never hybrid". This is a statement of

a) Law of dominance b) Law of independent assortment

c) Law of segregation d) Law of random fertilization

18. Gene which suppresses other genes activity but does not lie on the same locus is called as

a) Epistatic b) Supplement only c) Hypostatic d) Codominant

19. Pure tall plants are crossed with pure dwarf plants. In the F1 generation, all plants were tall. These tall plants of F1 generation were selfed and the ratio of tall to dwarf plants obtained was 3:1. This is called

a) Dominance b) Inheritance c) Codominance d) Heredity

20. The dominant epistatis ratio is (May22)

a) 9:3:3:1 **b) 12:3:1** c) 9:3:4 d) 9:6:1

21. Select the period for Mendel's hybridization experiments

a) 1856 - 1863 b) 1850 - 1870 c) 1857 - 1869 d) 1870 - 1877

22. Among the following characters which one was not considered by Mendel in his experimentation pea?

a) Stem – Tall or dwarf

b) Trichomal – glandular or non-glandular

c) Seed – Green or yellow

d) Pod – Inflated or constricted

23. Name the seven contrasting traits of Mendel.

Character	Dominant	Recessive
Plant Height	Tall	Dwarf
Flower position	Axial	Terminal
Flower colour	Purple	White
Pod form	Inflated	Constricted
Pod colour	Green	Yellow
Seed shape	Round	Wrinkled
Cotyledon colour	Yellow	Green

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

- A true breeding lines (Pure-breeding strains) means it has undergone continuous self pollination having stable trait inheritance from parent to offspring.
- Pure line breed refers to homozygosity only.

25. Give the names of the scientists who rediscovered Mendelism. (June23,Mar24)

- Hugo de vries - Holland
- Carl correns - Germany
- Erich von Tschermak - Austria

26. What is back cross?

- Back cross is a cross of F1 hybrid with any one of the parental genotypes.
- It involves the cross between the F1 off spring with either of the two parents.

27. Define Genetics.

- Genetics – Th e Science of heredity
- It deals with the mechanism of transmission of characters from parents to off springs.

28. What are multiple alleles (Aug21)

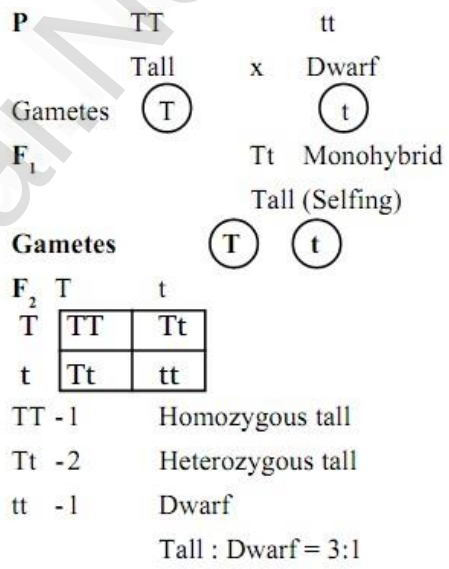
- Three or more allelic forms of a gene occupy the same locus in a given pair of homologous chromosomes, they are said to be called multiple alleles.

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

- His experiments were carefully planned and he used large samples.
- He applied mathematics and statistical methods.
- He followed scientific methods and kept accurate and detailed records.

30. Explain the law of dominance in monohybrid cross.

- Monohybrid cross is the inheritance of a single character (plant height).
- The Law of Dominance and the Law of Segregation give suitable explanation to Mendel's monohybrid cross.



31. Differentiate incomplete dominance and codominance. (May22)

Incomplete Dominance	Co dominance
When one allele is not completely dominant to another allele it shows incomplete dominance.	This pattern occurs due to simultaneously (joint) expression of both alleles in the heterozygous.
The F1 heterozygous phenotype differs from both the parental homozygous phenotype	The F1 heterozygous genotype differ from either of the homozygous genotype.
Example: Mirabilis jalapa (or) 4'O clock plant.	Example: Red and white flower of camella (or) ABO blood group in human.

32. What is meant by cytoplasmic inheritance. (Mar20)

- Cytoplasmic organelles such as chloroplast and mitochondrion that act as inheritance vectors,called Cytoplasmic inheritance.

33. Describe dominant epistasis with an example. (Mar20,23, Aug21)

- It is a gene interaction in which two alleles of a gene at one locus interfere and suppress or mask the phenotypic expression of a different pair of alleles of another gene at another locus.

P WWgg x wwGG

G (Wg) x (wG)

F1 generation WwGg

G (WG) (Wg) (wG) (wg)

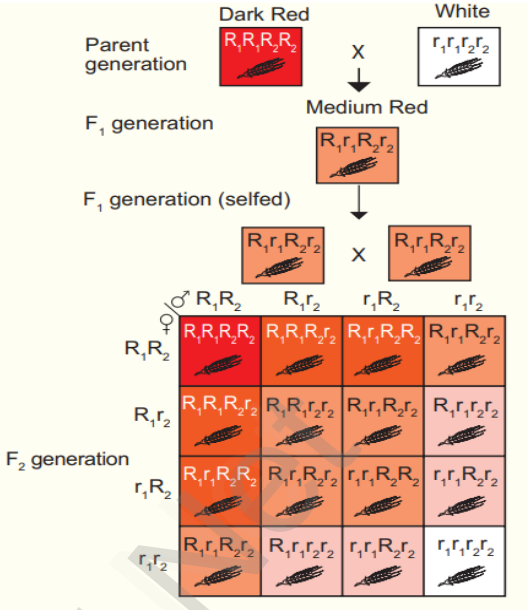
F2 generation

	WG	**Wg**	**wG**	**Wg**
WG	WWGG White	WWGg White	WwGG White	WwGg White
Wg	WWGg White	WWgg White	WwGg White	Wwgg White
wG	WwGG White	WwGg White	wwGG Yellow	wwGg Yellow
Wg	WwGg White	Wwgg White	wwGg Yellow	wwgg Green

Phenotypic ratio – 12 : 3 : 1

34. Explain polygenic inheritance with an example. (Mar20)

- A group of genes that together determine (contribute) a characteristic of an organism is called polygenic inheritance.
- It was first demonstrated by Swedish Geneticist H. Nilsson - Ehle (1909) in wheat kernels.



35. Differentiate continuous variation with discontinuous variation.

Continuous Variation	Discontinuous Variation
In continuous variation, the characteristics are controlled by many genes.	In discontinuous variation, the characteristics are controlled by one or two major genes.
one extreme to the other without any break.	one extreme to the other with some break.
Quantitative inheritance	Qualitative inheritance
The phenotypic expression is affected by environmental conditions.	The phenotypic expression is unaffected by environmental conditions.
There is overlapping between the two phenotypes	There is no overlapping between the two phenotypes
E.g: Human skin and Height.	E.g: Height of pea plant.

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

- A single gene affects multiple traits and alter the phenotype of the organism is called Pleiotropy.
- The Pleiotropic gene influences a number of characters simultaneously.
- Such genes are called pleiotropic gene.
- Mendel noticed in peas (Pisum sativum).
- purple flowers, brown seeds and dark spot on the axils of the leaves crossed with white flowers, light coloured seeds and no spot on the axils of the leaves,
- Flower colour, seed colour and a leaf axil spot all were inherited together as a single unit.

- This is due to the three traits were controlled by a single gene with dominant and recessive alleles.

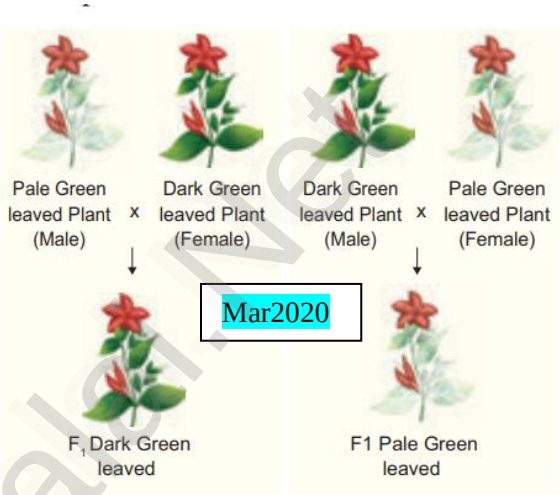
37. Bring out the inheritance of chloroplast gene with an example. (or)

Explain in detail about incomplete dominance. (or)

Give an detail account on 4'O clock plant. (Mar20, Mar24)

- Cytoplasmic organelles such as chloroplast and mitochondrion that act a inheritance vectors, called Cytoplasmic inheritance.
- It is found in 4 O' Clock plant (Mirabilis jalapa)
- There are two types of variegated leaves

1. Dark green leaved plants and
2. Pale green leaved plants.



- When the pollen of dark green leaved plant (male) is transferred to the stigma of pale green leaved plant (female) and pollen of pale green leaved plant is transferred to the stigma of dark green leaved plant.
- In each cross, the F1 plant reveals the character of the plant which is used as female plant.
- It is due to the chloroplast gene found in the ovum of the female plant.

ADDITIONAL QUESTIONS:

1. Explain mendel's Dihybrid cross.

- Mendel also experimentally studied the segregation and transmission of two pairs of contrasting characters at a time. This was called the **Dihybrid cross**

P RRYY x rryy

G **RY** x **ry**

F1 RrYy

G **RY** **Ry** **rY** **ry**

F2 generation

	RY	**Ry**	**rY**	**Ry**
RY	RRYY Round Yellow	RRYy Round Yellow	RrYY Round Yellow	RrYy Round Yellow
Ry	RRYy Round Yellow	RRyy Round Green	RrYy Round Yellow	Rryy Round Green
Ry	RrYY Round Yellow	RrYy Round Yellow	rrYY Wrinkled Yellow	rrYy Wrinkled Yellow
Ry	RrYy Round Yellow	Rryy Round Green	rrYy Wrinkled Yellow	rryy Wrinkled Green

Phenotypic ratio – 9:3:3:1

ADDITIONAL QUESTIONS:

1. Define Test cross.

- Test cross is crossing an individual of unknown genotype with a homozygous recessive.

2. What are lethal genes.

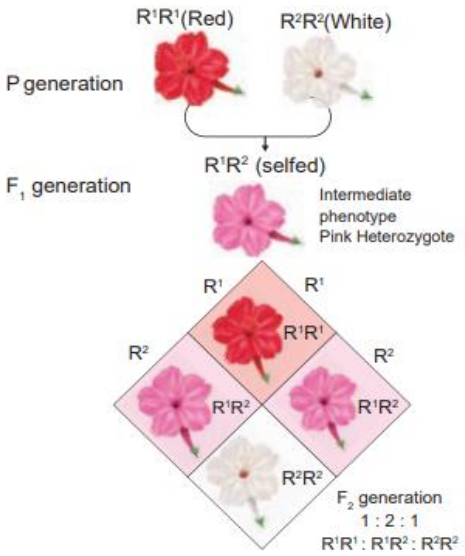
- An allele which has the potential to cause the death of an organism is called a "Lethal Allele".

3. Define Atavism.

- Atavism is a modification of a biological structure whereby an ancestral trait reappears after having been lost through evolutionary changes in the previous generations.

4. Explain Incomplete dominance in 4'O clock plant? (Aug22, Mar23)

- Example: *Mirabilis jalapa*
- when the pure breeding homozygous red ($R^1 R^1$) parent is crossed with homozygous white ($R^2 R^2$), the phenotype of the F1 hybrid is heterozygous pink ($R^1 R^2$).
- Phenotypic ratio (1:2:1) Red-1: Pink-2 : White-1
- Genotypic ratio (1:2:1) $R^1 R^1 : R^1 R^2 : R^2 R^2$



LESSON 03 CHROMOSOMAL BASIS OF INHERITANCE

1. An allohexaploidy contains

a) Six different genomes b) Six copies of three different genomes

c) Two copies of three different genomes d) Six copies of one genome

2. 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

3. Match list I with list II

List I	List II
A. A pair of chromosomes extra with diploid	i) monosomy
B. One chromosome extra to the diploid	ii) tetrasomy
C. One chromosome loses from diploid	iii) trisomy
D. Two individual chromosomes lose from diploid	iv) double monosomy

a) A-i, B-iii, C-ii, D-iv

b) A-ii, B-iii, C-iv, D-i

c) A-ii, B-iii, C-i, D-iv

d) A-iii, B-ii, C-i, D-iv

4. Which of the following sentences are correct?

1. The offspring exhibit only parental combinations due to incomplete linkage
2. The linked genes exhibit some crossing over in complete linkage
3. The separation of two linked genes are possible in incomplete linkage
4. Crossing over is absent in complete linkage

a) 1 and 2 b) 2 and 3 **c) 3 and 4** d) 1 and 4

5. Accurate mapping of genes can be done by three point test cross because increases

a) Possibility of single cross over b) Possibility of double cross over

c) Possibility of multiple cross over d) Possibility of recombination frequency

6. Due to incomplete linkage in maize, the ratio of parental and recombinants are

a) 50:50 **b) 7:1:1:7** c) 96.4: 3.6 d) 1:7:7:1

7. Genes G S L H are located on same chromosome. The recombination percentage is between L and G is 15%, S and L is 50%, H and S are 20%. The correct order of genes is

a) GHSL b) SHGL c) SGHL d) HSLG

8. The point mutation sequence for transition, transition, transversion and transversion in DNA are

a) A to T, T to A, C to G and G to C

b) A to G, C to T, C to G and T to A

c) C to G, A to G, T to A and G to A

d) G to C, A to T, T to A and C to G

9. If haploid number in a cell is 18. The double monosomic and trisomic number will be

a) 34 and 37 b) 34 and 35 c) 37 and 35 d) 17 and 19

10. Changing the codon AGC to AGA represents

a) missense mutation b) nonsense mutation c) frameshift mutation d) deletion mutation

11. Assertion (A): Gamma rays are generally use to induce mutation in wheat varieties.

Reason (R): Because they carry lower energy to non-ionize electrons from atom

a) A is correct. R is correct explanation of A **b) A is correct. R is not correct explanation of A**

c) A is correct. R is wrong explanation of A d) A and R is wrong

12. How many map units separate two alleles A and B if the recombination frequency is 0.09?

a) 900 cM b) 90 cM c) 9 cM d) 0.9 cM

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

i) What is the name of this phenomenon?

➢

ii) Draw the cross with suitable example.

➢

iii) Write the observed phenotypic ratio.

➢ **Phenotypic ratio 7:1:1:7**

14. If you cross dominant genotype PV/PV male Drosophila with double recessive female and obtain F1 hybrid. Now you crossF1 male with double recessive female.

i) What type of linkage is seen?

ii) Draw the cross with correct genotype.

iii) What is the possible genotype in F2 generation?

15.

S. no	Gamete types	Number of progenies
1.	ABC	349
2.	Abc	114
3.	abC	124
4.	AbC	5
5.	aBc	4
6.	aBC	116
7.	ABc	128
8.	abc	360

i) What is the name of this test cross?

ii) How will you construct gene mapping from the above given data?

iii) Find out the correct order of genes.

16. What is the difference between missense and nonsense mutation? (May22, June23)

Missence mutation	Non sense mutation
The mutation where the codon for one amino acid is changed into a **codon for another amino acid**.	The mutations where codon for one amino acid is changed into **a termination or stop codon**.

17.

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

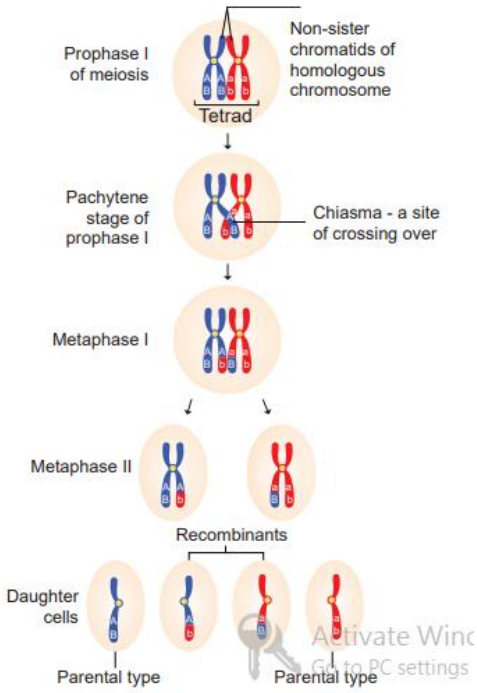
- Reverse tandem duplication.
- The duplicated segment is located immediately after the normal segment but the gene sequence order will be reversed.

18. Write the salient features of Sutton and Boveri concept.

- Somatic cells of organisms are derived from the zygote by repeated cell division (mitosis).
- These consist of two identical sets of chromosomes.
- One set is received from female parent (maternal) and the other from male parent (paternal).
- These two chromosomes constitute the homologous pair.
- Chromosomes retain their structural uniqueness and individuality throughout the life cycle of an organism.
- The behaviour of chromosomes during the gamete formation (meiosis) provides evidence to the fact that genes or factors are located on chromosomes.

19. Explain the mechanism of crossing over.

- Crossing over is a precise process that includes stages like synapsis, tetrad formation, cross over and terminalization.



Synapsis:

- Intimate pairing between two homologous chromosomes is initiated during zygotene stage of prophase I of meiosis I.Homologous chromosomes are aligned side by side resulting in a pair of homologous chromosomes called bivalents.

- **Procentric synapsis:** Pairing starts from middle of the chromosome.
- **Proterminal synapsis:** Pairing starts from the telomeres.
- **Random synapsis:** Pairing may start from anywhere.

Tetrad Formation

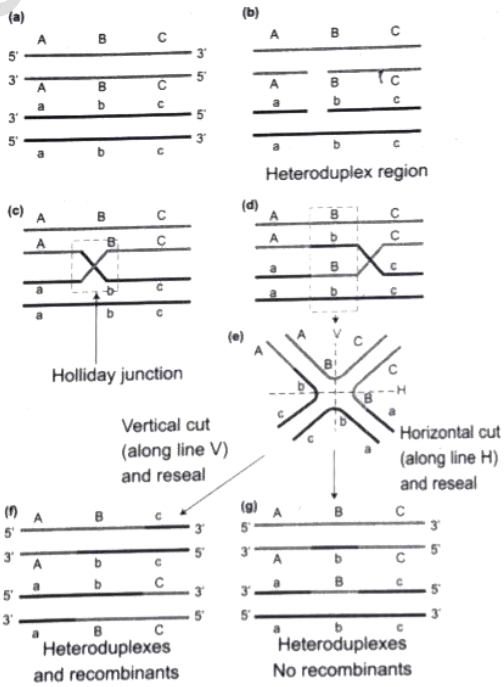
- Each homologous chromosome of a bivalent begin to form two identical sister chromatids.
- At this stage each bivalent has four chromatids. This stage is called tetrad stage.
- After tetrad formation, crossing over occurs in pachytene stage.
- The non-sister chromatids of homologous pair make a contact at one or more points.
- **Chiasmata** - contact between nonsister chromatids of homologous chromosomes.
- This results in reciprocal exchange of equal and corresponding segments between them.

Terminalisation

- After crossing over, chiasma starts to move towards the terminal end of chromatids. This is known as terminalisation. As a result, complete separation of homologous chromosomes occurs.

20. Write the steps involved in molecular mechanism of DNA recombination with diagram.

- Crossing over results in the formation of new combination of characters in an organism called recombinants.
- In this, segments of DNA are broken and recombined to produce new combinations of alleles. This process is called Recombination.
- It was Proposed by Robin Holliday in 1964.
- Steps involved in molecular mechanism of DNA recombination are:
- Isolation of genetic material
- Cutting of DNA at specific locations
- Joining of DNA fragments by ligation and homopolymer tailing
- Insertion of DNA into the host cell.
- Selection and screening of transformed cells.



21. How is Nicotiana exhibit self- incompatibility. Explain its mechanism.

- In Nicotiana self sterility or self incompatibility is due to multiple alleles.
- The pollen from a plant is unable to germinate on its own stigma - and no fertilization.
- The gene for self incompability can be - 'S' which has allelic series S_1 , S_2 , S_3 , S_4 & S_5 .
- Cross-fertilizing tobacco - were not always homozygous as S_1 S_1 or S_2 S_2 , but heterozygous
- Crosses between different S_1 S_2 plants, pollen tube did not develop normally.
- But effective - development observed when cross was made with other than S_1 S_2 Eg. S_3 S_4 .

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

22. How sex is determined in monoecious plants. write their genes involved in it.

- Unisexuality in maize occurs through the selective abortion of stamens in ear florets and pistils in tassel florets.
- The allele for barren plant (ba)- when homozygous makes the stalk staminate (eliminating silk and ears)
- The allele for tassel seed (ts) - transforms tassel into a pistillate structure (no pollen produced).
- Most of these mutations are shown to be defects in Gibberellins biosynthesis.
- Gibberellins play an important role in the suppression of stamens in florets on the ears.

Genotype	Dominant/ recessive	Modification	Sex
ba/ba ts/ts	Double recessive	Lacks silk on the stalk, but transformed tassel to pistil	Rudimentary female
ba/ba ts^+/ts^+	Recessive and dominant	Lacks silk and have tassel	Male
ba^+/ba^+ ts^+/ts^+	Double dominant	Have both tassel and cob	Monoecious
ba^+/ba^+ ts/ts	Dominant and recessive	Bears cob and lacks tassel	Normal female

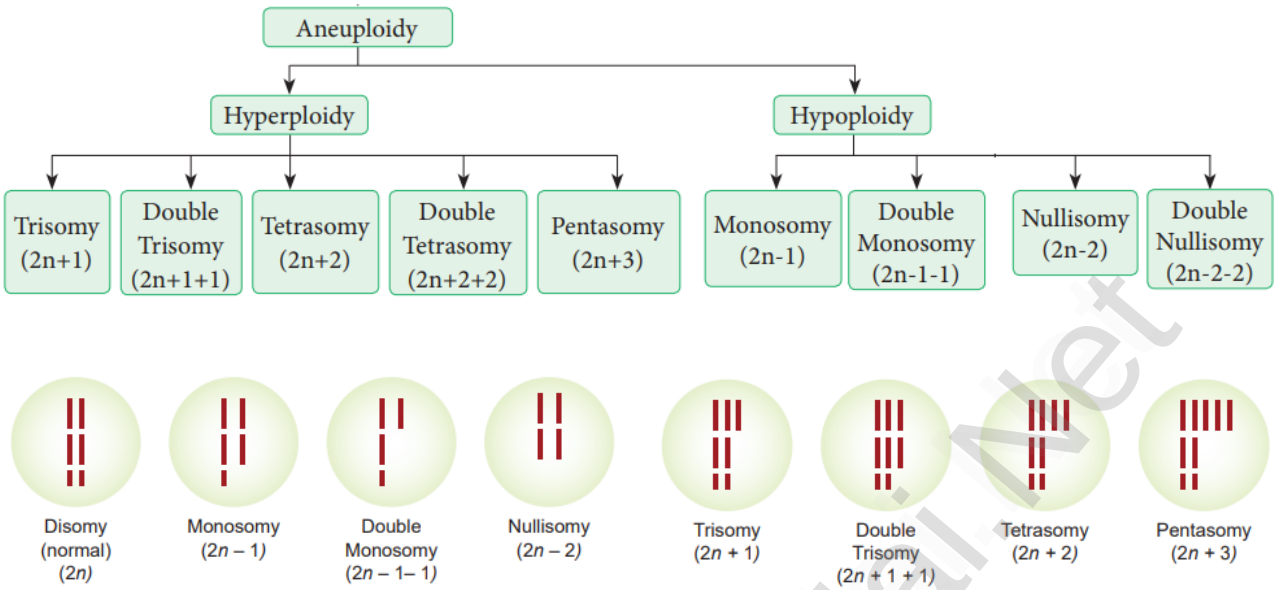
23. What is gene mapping? Write its uses. (mar20, Mar24)

- The diagrammatic representation of position of genes and related distance between adjacent genes is called Genetic mapping.

Uses of genetic mapping:

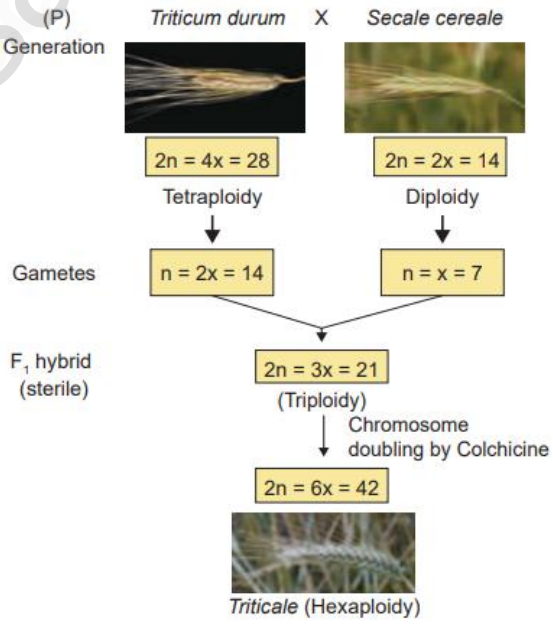
- It is used to determine gene order, identify the locus of a gene and calculate the distance between the genes.
- They are useful in predicting results of dihybrid and trihybrid crosses.
- It helps to understand the overall genetic complexity of particular organism.

24. Draw the diagram of different types of aneuploidy.



25. Mention the name of man-made cereal. How it is formed? (Aug21, June23)

- Triticale, the successful first man made cereal - It has 3 main groups.
- Tetraploidy : Crosses between diploid wheat and rye.
- Hexaploidy : Crosses between tetraploid wheat Triticum durum (macaroni wheat) and rye
- Octoploidy : Crosses between hexaploid wheat T. aestivum (bread wheat) and rye
- Hexaploidy Triticale hybrid plants demonstrate characteristics of both macaroni - wheat & rye.



ADDITIONAL QUESTIONS:

1. Give the types of synapsis. (July 2022, March 2023)

- Procentric synapsis
- Pro terminal synapsis.
- Random synapsis.

LESSON 04 PRINCIPLES AND PROCESSES OF BIOTECHNOLOGY

1. Restriction enzymes are (Aug21)

a. Not always required in genetic engineering b. Essential tools in genetic engineering

c. Nucleases that cleave DNA at specific sites **d. both b and c**

2. Plasmids are

a. circular protein molecules b. required by bacteria

c. tiny bacteria **d. confer resistance to antibiotics**

3. EcoRI cleaves DNA at

a. AGGGTT b. GTATATC **c. GAATTC** d. TATAGC

4. Genetic engineering is

a. making artificial genes. **b. hybridization of DNA of one organism to that of the others.**

c. production of alcohol by using micro organisms.

d. making artificial limbs, diagnostic instruments such as ECG, EEG etc.,

5. Consider the following statements:

I. Recombinant DNA technology is popularly known as genetic engineering is a stream of biotechnology which deals with the manipulation of genetic materials by man invitro

II. pBR322 is the first artificial cloning vector developed in 1977 by Boliver and Rodriguez from E.coli plasmid

III. Restriction enzymes belongs to a class of enzymes called nucleases.

Choose the correct option regarding above statements

a. I & II b. I & III c. II & III **d. I,II & III**

6. The process of recombinant DNA technology has the following steps

I. amplication of the gene II. Insertion of recombinant DNA into the host cells

III. Cutting of DNA at specific location using restriction enzyme .

IV. Isolation of genetic material (DNA) Pick out the correct sequence of step for recombinant DNA technology.

a. II, III, IV, I b. IV, II, III, I c. I, II, III, IV **d. IV, III, I, II**

7. Which one of the following palindromic base sequence in DNA can be easily cut at about the middle by some particular restriction enzymes?

a. 5 CGTTCG 3 3 ATCGTA 5 b. 5 GATATG 3 3 CTACTA 5

c. 5 GAATTC 3 3 CTTAAG 5 d. 5 CACGTA 3 3 CTCAGT 5

8. pBR 322, BR stands for

a. Plasmid Bacterial Recombination b. Plasmid Bacterial Replication

c. Plasmid Boliver and Rodriguez d. Plasmid Baltimore and Rodriguez

9. Which of the following one is used as a Biosensors?

a. Electrophoresis b. Bioreactors c. Vectors d. Electroporation

10. Match the following :

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

	1	2	3	4
A)	a	b	c	d
B)	c	d	b	a
C)	a	c	b	d
D)	c	d	a	b

Ans: (D)

11. In which techniques Ethidium Bromide is used?

a. Southern Blotting techniques b. Western Blotting techniques

c. Polymerase Chain Reaction **d. Agrose Gel Electroporosis**

12. Assertion : Agrobacterium tumifaciens is popular in genetic engineering because this bacteriumis associated with the root nodules of all cereals and pulse crops

Reason: A gene incorporated in the bacterial chromosomal genome gets atomatically transferred to the cross with which bacterium is associated.

a) Both assertion and reason are true. But reason is correct explanation of assertion.

b) Both assertion and reason are true. Butreason is not correct explanation of assertion.

c) Assertion is true, but reason is false. d) Assertion is false, but reason is true.

e) Both assertion and reason are false.

13. Which one of the following is not correct statement.

a) Ti plasmid causes the bunchy top disease b) Multiple cloning site is known as Polylinker

c) Non viral method transfection of Nucleic acid in cell

d) Polylactic acid is a kind of biodegradable and bioactive thermoplastic.

14. An analysis of chromosomal DNA using the southern hybridisation technique does not use

a) Electrophoresis b) Blotting c) Autoradiography **d) Polymerase Chain Reaction**

15. An antibiotic gene in a vector usually helps in the selection of

a) Competent cells **b) Transformed cells** c) Recombinant cells d) None of the above

16. Some of the characteristics of Bt cotton are

a) Long fibre and resistant to aphids b) Medium yield, long fibre and resistant to beetle pests

c) high yield and production of toxic protein crystals which kill dipteran pests.

d) High yield and resistant to ball worms

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

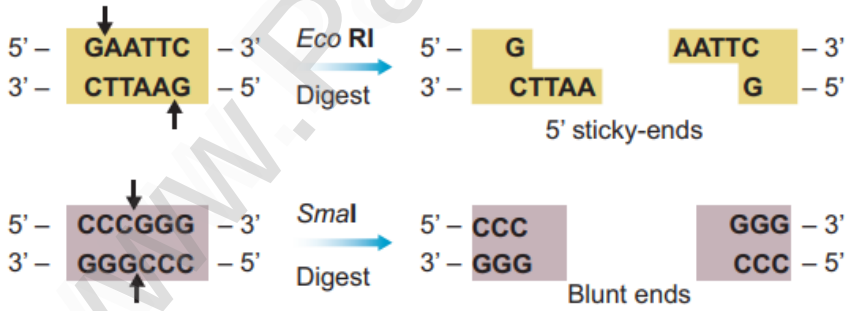
- Biomass for bulk production of single cell protein , alcohol, and biofuel
- Enzymes as biosensors, in processing industry
- Biofuels for production of hydrogen, alcohol, methane
- Microbial inoculants as biofertiliser, and nitrogen fixers.
- Plant and animal cell culture for production of secondary metabolites, monoclonal antibodies.

18. What are the materials used to grow microorganism like Spirulina? (Aug21, Mar23)

- Spirulina can be grown easily on materials like waste water from potato processing plants (containing starch), straw, molasses, animal manure and even sewage, to produce large quantities and can serve as food rich in protein.

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

- The exact kind of cleavage produced by a restriction enzyme is important in the design of a gene cloning experiment.
- Some cleave both strands of DNA through the centre resulting in blunt or flush end. These are known as symmetric cuts.
- Some enzymes cut in a way producing protruding and recessed ends known as sticky or cohesive end. Such cut are called staggered or asymmetric cuts.
- Two other enzymes that play an important role in recombinant DNA technology are DNA ligase and alkaline phosphatise.



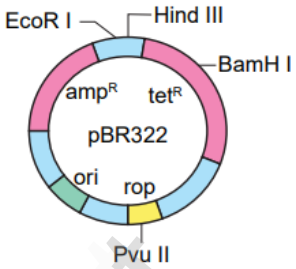
20. What are the enzymes you can used to cut terminal end and internal phospho di ester bond of nucleotide sequence? (May22)

- **Exonucleases** - These are enzymes which break the terminal end of DNA molecule. Example: Bal 31.
- **Endonucleases** - These are enzymes which break the internal phosphor diester bonds with in a DNA molecule Example: EcoRI.

21. Name the chemicals used in gene transfer. (Aug21, Mar23)

- Poly Ethylene Glycol (PEG) and Dextran Sulphate.

22. What do you know about the word pBR332? (May2022)



- It is used as a cloning vector.
- It contains 4361 base pairs.
- P – plasmid.
- B – Boliver.
- R – Rodroguez.
- 322 - The number of plasmid developed from their lab.
- ampR and tetR – Antibiotic resistants.

23. Mention the application of Biotechnology. (Sep20)

- Single cell protein from Spirulina is utilized in food industries.
- Biochip based biological computer is one of the successes of biotechnology.
- The synthesis of vaccines, enzymes, antibiotics, dairy products and beverages are the products of biotech industries.
- Production of secondary metabolites, biofertilizers, biopesticides and enzymes.
- The synthesis of human insulin and blood protein in E.coli and utilized for insulin deficiency disorder in human is a breakthrough in biotech industries in medicine.
- Biomass energy, biofuel, Bioremediation, phytoremediation for environmental biotechnology.

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

- A restriction enzyme or restriction endonuclease is an enzyme that cleaves DNA into fragments at or near specific recognition sites within the molecule.
- **Exonucleases** - These are enzymes which break the terminal end of DNA molecule. Eg. Bal 31, Exonuclease 111.
- **Endonucleases** - These are enzymes which break the internal phosphor diester bonds with in a DNA molecule Eg. Hind11, EcoR1, Pvul, Bam HI, Taq I.
- There are three main classes of restriction endonuclease : Type I, Type II and Type III, which differ slightly by their mode of action.
- Hind II – cut DNA at a point of specific sequence of 6 pairs.

25. Is their any possibilities to transfer a suitable desirable gene to host plant without vector? Justify your answer.

Chemical mediated gene transfer:

- Chemicals Poly Ethylene Glycol (PEG) & Dextran sulphate – induce DNA uptake into plant protoplasts.

Microinjection:

- With fine tipped glass needle, DNA is directly injected into the nucleus. The protoplasts are immobilized on a solid support (Agarose on a microscopic slide).

Electroporation method of gene transfer:

- Protoplasts, cells or tissues subjected to a pulse of high voltage electric power to make transient pores in the plasma membrane, through which uptake of foreign DNA occurs.

Liposome – mediated transfer

- The gene or DNA is transferred in an encapsulated form from Liposome (the artificial phospholipid vesicles) into vacuole of plant cells.

Biolistics:

- The DNA particle with gold or tungsten particle coating are bombarded into the target tissue by gene gun or micro projectile gun / shot gun

26. How will you identify a vector?

- It should be small in size and of **low molecular weight**, less than 10 Kb (kilo base pair) in size so that entry/transfer into host cell is easy.
- Vector must **contain an origin of replication** so that it can independetly replicate within the host.
- It should contain a suitable marker such as **antibiotic resistance**, to permit its detection in transformed host cell.
- Vector should have **unique target sites** for integration with DNA insert and carries it to the host.

27. Compare the various types of Blotting techniques.

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

28. Write the advantages of herbicide tolerant crops.

- Weed control improves higher crop yields;
- Reduces spray of herbicide
- Reduces competition between crop plant and weed
- Use of low toxicity compounds which do not remain active in the soil
- The ability to conserve soil structure and microbes.

29. Write the advantages and disadvantages of Bt cotton.

Advantages The advantages of Bt cotton are:

- Yield of cotton is increased due to effective control of bollworms.
- Reduction in insecticide use in the cultivation of Bt cotton.
- Potential reduction in the cost of cultivation.

Disadvantages Bt cotton has some limitations:

- Cost of Bt cotton seed is high.
- Effectiveness up to 120 days after that efficiency is reduced.
- Ineffective against sucking pests like jassids, aphids and whitefly.
- Affects pollinating insects and thus yield.

30. What is bioremediation? give some examples of bioremediation. (Aug22, Mar23)

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

Examples:

- **Phytoremediation** - use of plants to bring about remediation of environmental pollutants.
- **Mycoremediation** - use of fungi to bring about remediation of environmental pollutants.
- **Bioleaching** is the use of microorganisms in solution to recover metal pollutants from contaminated sites.
- **Bioaugmentation** is the addition of selected microbes to speed up degradation process.

31. Write the benefits and risk of Genetically Modified Foods.

GM Food – Benefits:

- High yield without pest.
- 70% reduction of pesticide usage.
- Reduce soil pollution problem.
- Conserve microbial population in soil.

Risks :

- It is believed to affect liver, kidney function and cancer.
- Hormonal imbalance and physical disorder Anaphylactic shock (sudden hypersensitive reaction) and allergies.
- Adverse effect in immune system because of bacterial protein.
- Loss of viability of seeds show in terminator seed technology of GM crops.

ADDITIONAL QUESTIONS:

1. Define C value. (Aug22)

- Genome content of an organism is expressed in terms of number of base pairs or in terms of the content of DNA which is expressed as c-value.

2. Name the enzymes which are used in Biotechnology? (Mar20, Mar24)

- Restriction endonuclease.
- DNA ligase.
- Alkaline phosphatase.

3. What is Single cell protein? Write its uses? (Mar24)

Single cell protein

- The dried cells of microorganisms that are used as protein supplement in human foods or animal feeds are called Single cell proteins.

Applications of Single-Cell Protein

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

LESSON 5 PLANT TISSUE CULTURE

1. Totipotency refers to (Aug21)

a) capacity to generate genetically identical plants.

b) capacity to generate a whole plant from any plant cell / explant.

c) capacity to generate hybrid protoplasts.

d) recovery of healthy plants from diseased plants.

2. Micro propagation involves

a) vegetative multiplication of plants by using micro-organisms.

b) vegetative multiplication of plants by using small explants.

c) vegetative multiplication of plants by using microspores.

d) Non-vegetative multiplication of plants by using microspores and megaspores.

3. Match the following :

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

	1	2	3	4
a)	C	A	D	B
b)	A	C	B	D
c)	B	A	D	C
d)	D	B	C	A

Ans: (a)

4. The time duration for sterilization process by using autoclave is __ minutes and the temperature is ____ (Aug22)

a) 10 to 30 minutes and 125° C

b) 15 to 30 minutes and 121° C

c) 15 to 20 minutes and 125° C

d) 10 to 20 minutes and 121° C

5. Which of the following statement is correct

a) Agar is not extracted from marine algae such as seaweeds.

b) Callus undergoes differentiation and produces somatic embryoids.

c) Surface sterilization of explants is done by using mercuric bromide

d) PH of the culture medium is 5.0 to 6.0

6. Select the incorrect statement from given statement

a) A tonic used for cardiac arrest is obtained from Digitalis purpuria

b) Medicine used to treat Rheumatic pain is extracted from Capsicum annum

c) An anti malarial drug is isolated from Cinchona officinalis.

d) Anti-cancinogenic property is not seen in Catharanthus roseus.

7. Virus free plants are developed from (Mar20, Mar23)

a) Organ culture **b) Meristem culture** c) Protoplast culture d) Cell suspension culture

8. The prevention of large scale loss of biological interity

a) Biopatent b) Bioethics **c) Biosafety** d) Biofuel

9. Cryopreservation means it is a process to preserve plant cells, tissues or organs

a) at very low temperature by using ether. b) at very high temperature by using liquid nitrogen

c) at very low temperature of -196 by using liquid nitrogen

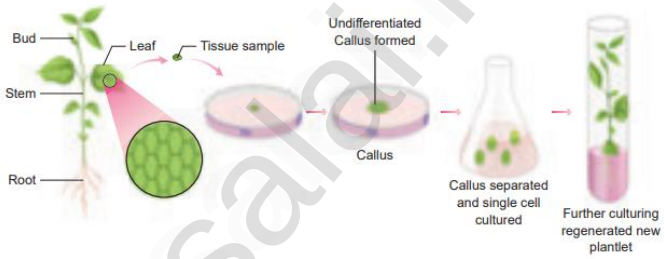
d) at very low temperature by using liquid nitrogen

10. Solidifying agent used in plant tissue culture is (Sep20)

a) Nicotinic acid b) Cobaltous chloride c) EDTA **d) Agar**

11. What is the name of the process given below? Write its 4 types.

- Plant tissue culture is the process given in the picture.
- Organ culture
- Meristem culture
- Protoplast culture
- Cell culture



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

- Sterilization is the technique employed to get rid of microbes such as bacteria and fungi in the culture medium.

Sterilization	Materials	Procedure
Aseptic Environment	glassware, forceps, scalpels, etc.	➔ Autoclaving at 15 psi (121°C) for 15 to 30 minutes. ➔ Treat with 70% ethanol.
Culture room	Floor and walls	➔ Washed with detergent ➔ 2% sodium hypochlorite or 95% ethanol. ➔ Exposure to UV radiation for 15 mins.
Nutrient Media	Culture media	➔ autoclave at 15 psi (121°C) for 15 to 30 minutes
Explants	Plant material	➔ Running tap water ➔ 0.1% mercuric chloride, 70% ethanol

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

- **Cell suspension culture -** The growing of cells including the culture of single cells or small aggregates of cells in vitro in liquid medium.
- The cell suspension is prepared by transferring a portion of callus to the liquid medium and agitated using rotary shaker instrument.
- The cells are separated from the callus tissue and used for cell suspension culture.

14. What do you mean Embryoids? Write its application. (Sep20, Mar24)

- Somatic embryogenesis is the formation of embryos from the callus tissue directly and these embryos are called Embryoids.
- It can be used for the production of synthetic seeds.
- It possible in any plant.
- It provides potential plantlets which after hardening period can establish into plants.

15. Give the examples for micro propagation performed plants.

- Pineapple, Banana, Strawberry and Potato.

16. Explain the basic concepts involved in plant tissue culture. (Au21)

Totipotency

- The property of a living plant to have a potential to give rise to a complete individual plant.

Differentiation

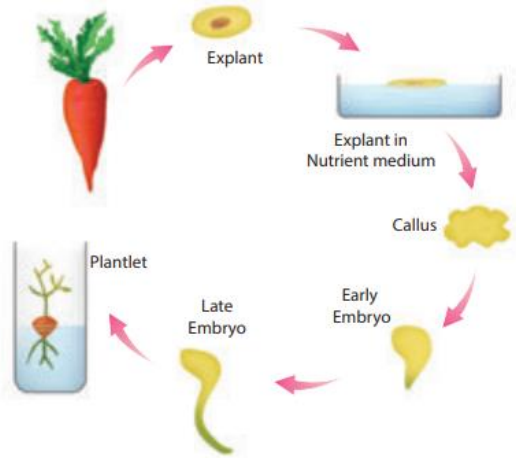
- The process of biochemical and structural changes by which cells become specialized in form and function.

Redifferentiation

- The further differentiation of already differentiated cell into another type of cell.

Dedifferentiation

- Reversion of mature cells leads to the formation of callus.



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

Organ culture:

- The culture of embryos, anthers, ovaries, roots, shoots or other organs of plants on culture media.

Meristem culture:

- The culture of any plant meristematic tissue on culture media.

Protoplast Culture:

- Protoplasts are cells without a cell wall, but bounded by a cell membrane or plasma membrane.
- **Steps of protoplast culture:** Isolation of protoplast → Fusion of protoplast → Culture of protoplast → Selection of somatic hybrid cells.

Cell Suspension Culture

- The growing of cells including the culture of single cells or small aggregates of cells in vitro in liquid medium.
- The cell suspension is prepared by transferring a portion of callus to the liquid medium and agitated using rotary shaker instrument.
- The cells are separated from the callus tissue and used for cell suspension culture.

18. Give an account on Cryopreservation. (Mar20, Mar24)

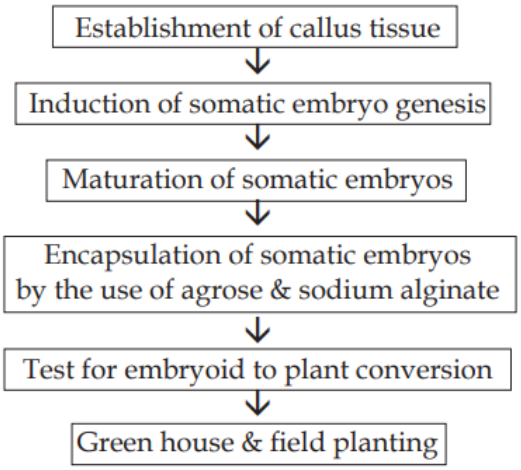
- It is a process of preservation of plant extracts at **-196°C** using liquid nitrogen.
- Protectants – Dimethyl sulphoxide, glycerol or sucrose.
- It stops the enzymatic or chemical activity.

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

- The conservation of living genetic resources like pollen, seeds or tissue of plant materials preservation in live condition are called germplasm conservation.
- It is used for many research works.
- It is a part of collection of seeds and pollen that are stored in seed or pollen banks.

20. Write the protocol for artificial seed preparation. (Sep20, Aug22)

- Artificial seeds or synthetic seeds (synseeds) are produced by using embryoids (somatic embryos) obtained through in vitro culture.



ADDITIONAL QUESTIONS:

1. What is organogenesis?

- The morphological changes occur in the callus leading to the formation of shoot and root is called organogenesis.
- Auxin and cytokinin induce shoot and root formation with the help of MS medium.

2. What are the applications of plant tissue culture? (May2022)

- Improved hybrids production through somatic hybridization.
- Encapsulated seeds (or) Synthetic seeds help in conservation of plant biodiversity.
- Production of disease resistant plants through meristem and shoot tip culture.
- Production of stress resistant plants like herbicide tolerant, heat tolerant plants.
- Micro propagation to obtain large number of plantlets within a short span.
- Production of Secondary metabolites – used in cosmetic and food industries.

3. List down the culture conditions PTC.

- pH - 5.6 to 6.0
- Temperature - 25°C ± 2°C
- Humidity - 50-60%
- Light Intensity - 1000 lux. (cool white fluorescent)
- Aeration - By automatic shaker

4. What are needed Lab – facilities for PTC?

- Washing facility for glassware and ovens.
- Medium preparation room with autoclave, electronic balance and pH meter.
- Transfer area sterile room with laminar air-flow bench
- High Efficiency Particulate Air (HEPA) filter to maintain aseptic condition.
- Culture facility:

  (i) Temperature – 22-28^{O}C

  (ii) Light – 2400 lux

  (iii) Humidity – 60 %

  (iv) light – 8-16 hours

5. Define – Synthetic seeds or Artificial seeds.

- Synthetic seeds are produced by encapsulation of embryoids in agarose gel or calcium alginate.

6. Define – Agar.

- A complex mucilaginous polysaccharide obtained from marine algae (sea weeds) used as solidifying agent in media preparation.

7. Differentiate Somaclonal variations and Gametoclonal variations.

- Somaclonal variations - Variation found in leaf, stem, root, etc.
- Gametoclonal variations - Variations found in gametes and gametophytes

8. Explain various steps in Protoplast culture.

Protoplast Culture

- Protoplasts are cells without a cell wall, but bounded by a cell membrane or plasma membrane.
- It is possible to regenerate whole plants from single cells.

Isolation of protoplast:

- Step 1: Small bit of plant taken.
- Step 2: Immersed in 0.5% Macrozyme and 2% Onozuka dissolved in 13% Sorbitol at pH of 5.4
- Step 3: Incubate over night at $25^{O}C$.
- Step 4: Transfer the protoplast to 20% sucrose solution.
- Step 5: Centrifuge to get pure protoplast.

Fusion of protoplast:

- Step 1: Use suitable fusogen (PEG).
- Step 2: Incubate in 25% – 30 % conc. Of PEG with Ca++ ions.
- Step 3: Result – protoplast shows agglutination and fusion.

Culture of protoplast:

- Step 1: Use MS medium plating or micro drop array technique.
- Step 2: Test with fluorescein diacetate.
- Step 3: incubate in continuous light 1000 – 2000 lux at $25^{O}C$.
- Step 4: Cell wall formed in 24 – 48 hours.
- Step 5: New cells occurs between 2 to 7 days.

Selection of somatic hybrid cells:

- The fusion product of protoplasts without nucleus of different cells is called a cybrid.
- Following this nuclear fusion happen. This process is called somatic hybridization.

9. Define - Cybrid. (Mar20)

- The fusion product of protoplasts without nucleus of different cells is called a cybrid.

10. Write down the advantages of Artificial seeds. (Aug22)

- It is easy to test the genotype of plants.
- They can potentially store for long time under cryopreservation method.
- Artificial seeds produce identical plants
- Millions of artificial seeds can be produced at any time at low cost.

LESSON 06 PRINCIPLES OF ECOLOGY

1. Arrange the correct sequence of ecological hierarchy starting from lower to higher level.

a) Individual organism → Population Landscape → Ecosystem

b) Landscape → Ecosystem → Biome → Biosphere

c) community → Ecosystem → Landscape → Biome

d) Population → organism → Biome → Landscape

2. Ecology is the study of an individual species is called

i) Community ecology ii) Autecology iii) Species ecology iv) Synecology

a) i only b) ii only c) i and iv only **d) ii and iii only**

3. A specific place in an ecosystem, where an organism lives and performs its functions is (Aug21)

a) habitat **b) niche** c) landscape d) biome

4. Read the given statements and select the correct option.

i) Hydrophytes possess aerenchyma to support themselves in water.

ii) Seeds of Viscum are positively photoblastic as they germinate only in presence of light.

iii) Hygroscopic water is the only soil water available to roots of plant growing in soil as it is present inside the micropores.

iv) High temperature reduces use of water and solute absorption by roots.

a) i, ii, and iii only b) ii, iii and iv c) ii and iii only **d) i and ii only**

5. Which of the given plant produces cardiac glycosides?

a) Calotropis b) Acacia c) Nepenthes d) Utricularia

6. Read the given statements and select the correct option.

i) Loamy soil is best suited for plant growth as it contains a mixture of silt, sand and clay.

ii) The process of humification is slow in case of organic remains containing a large amount of lignin and cellulose.

iii) Capillary water is the only water available to plant roots as it is present inside the micropores.

iv) Leaves of shade plant have more total chlorophyll per reaction centre, low ratio of chl a and chl b are usually thinner leaves.

a) i, ii and iii only b) ii, iii and iv only c) i, ii and iv only d) ii and iii only

7. Read the given statements and select the correct option.

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

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

a) Both statements A and B are incorrect.

b) Statement A is correct but statement B is incorrect.

c) Both statements A and B are correct but statement B is not correct explanation of statement A

d) Both statements A and B are correct and statement B is the correct explanation of statement A.

8. In soil water available for plants is (Aug22)

a) gravitational water b) chemically bound water c) capillary water d) hygroscopic water

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

i) Total soil water content in soil is called _____

ii) Soil water not available to plants is called _____

iii) Soil water available to plants is called _____

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

Ans: (a) Holand, Echard, Chresard.

10. Column I represent the size of the soil particles and Column II represents type of soil components. Which of the following is correct match for the Column I and Column IL

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

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

Ans: (c)

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

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

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

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

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

Ans: (a)

13. Ophrys an orchid resembling the female of an insect so as to able to get pollinated is due to phenomenon of

a) Myrmecophily b) Ecological equivalents **c) Mimicry** d) None of these

14. A free living nitrogen fixing cyanobacterium which can also form symbiotic association with the water fern Azolla

a) Nostoc **b) Anabaena** c) chlorella d) Rhizobium

15. Pedogenesis refers to (May22)

a) Fossils b) Water c) Population **d) Soil**

16. Mycorrhiza promotes plant growth by

a) Serving as a plant growth regulators **b) Absorbing inorganic ions from soil**

c) Helping the plant in utilizing atmospheric nitrogen d) Protecting the plant from infection

17. Which of the following plant has a nonsucculent xerophytic and thick leathery leaves with waxy coating (June23)

a) Bryophyllum b) Ruscus c) Nerium d) Calotropis

18. In a fresh water environment like pond, rooted autotrophs are

a) Nymphaea and typha b) Ceratophyllum and Utricularia

c) Wolffia and pistia d) Azolla and lemna

19. Match the following and choose the correct combination from the options given below:

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

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

Ans: (d)

20. Strong, sharp spines that get attached to animal's feet are found in the fruits of

a) Argemone b) Ecballium c) Heritier d) Crossandra

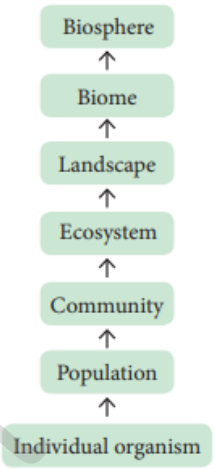
21. Sticky glands of Boerhaavia and Cleome support

a) Anemochory **b) Zoochory** c) Autochory d) Hydrochory

22. Define ecology.

- **Definition of Reiter (1885)** : "The study of living organisms, both plants and animals, in their natural habitats or homes."
- **Earnest Haeckel (1889)** : "Ecology is the study of the reciprocal relationship between living organisms and their environment."

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



- The interaction of organisms with their environment results in the establishment of grouping of organisms which is called ecological hierarchy or ecological levels of organization.

24. What are ecological equivalents? Give one example.

- Taxonomically different species occupying similar habitats (Niches) in different geographical regions are called Ecological equivalents.
- Example: Certain species of epiphytic orchids of Western Ghats of India differ from the epiphytic orchids of South America. But they are epiphytes.

25. Distinguish habitat and niche. (May22, Aug22, Mar24)

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

26. Why are some organisms called as eurythermals and some others as stenohaline?

- **Eurythermals:** Organisms which can tolerate a wide range of temperature fluctuations. Example: Zostera (A marine Angiosperm) and Artemisia tridentata.
- **Stenohaline :** Organisms which can withstand only small range of salinity. Example: Plants of estuaries

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

- Green algae or plants are not found beyond a certain depth, as light (not all colour components of visible spectrum. can reach only till a certain depth in sea and oceans.

28. What is Phytoremediation? (Mar24)

- Some plants like (soya bean, tomato, rice and Eichhornia) can be used to remove cadmium from contaminated soil, and this make suitable for cultivation is known as Phytoremediation.

29. What is Albedo effect and write their effects?

- Aerosols with small particles is reflecting the solar radiation entering the atmosphere.This is known as albedo effect.

- It reduces the temperature, photosynthesis and respiration

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

- A desert has little or no plants.
- Without plants, there is no organic material in the soil.
- So there is no organic horizon.

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

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

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

- Sandy soil contains 85% of sand and 15% of clay. And its size about 0.2 to 2 mm(larger in size) and low water holding capacity.

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

- The relationship between fig tree and wasp shows mutualism.
- Fig provides home to wasp.
- Wasp provides pollen that the fruit needs to ripen.
- The wasp while searching for sits to lay its egg, pollinates the fig's inflorescence.

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

- Lichen is a mutual association of an alga and a fungus.
- Fungus helps algae to absorb water and minerals.
- Algae performs photosynthesis and provide food to fungi

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

- It is an interaction between two species of organisms in which both are benefitted from the obligate association.
- Rhizobium (Bacterium) forms nodules in the roots of leguminous plants and lives symbiotically. The Rhizobium obtains food from leguminous plant and in turn fixes atmospheric nitrogen into nitrate, making it available to host plants.
- Water fern (Azolla) and Nitrogen fixing Cyanobacterium (Anabaena).
- Anabaena present in coralloid roots of Cycas. (Gymnosperm)

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

- Presence of adhesive organs to cling onto the host.
- Produce houstorial roots to absorbs nutrients from the vascular tissues of host plants

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

- A number of plants like ***Drosera*** are predators which consume insects and other small animals for their food as a source of nitrogen.
- Many herbivores like Cattles, Camels, Goats etc., Grazing and browsing may cause remarkable changes in vegetation.
- Many defense mechanisms are evolved to avoid their predations by plants. Example Thorns of Bougainvillea protect them from predators.

38. How does an orchid ophrys ensures its pollination by bees ?

- ***Ophrys*** an orchid, the flower looks like a female insect to attract the male insect to get pollinated by the male insect l It is otherwise called 'floral mimicry '.

39. Water is very essential for life. Write any three features for plants which enable them to survive in water scarce environment. (Sep20)

- Xenopytic plants have hick cutile on their leaf surface.
- Stomata is small shaped, it minimize water loss through transpiration.
- Leaves re reduced to spines.

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

- Submerged plants receive weaker illumination than exposed floating plants in a lake because all colours of the visible components of the spectrum of light does not enter or penetrate in the depth of water.

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

- When seeds or embryos begin to develops before they detach from the parent.
- Vivipary mode of seed germination is found in halophytes.

42. What is thermal stratification? Mention their types. (Mar20, Aug22)

- It is usually found in aquatic habitat.
- The change in the temperature profile with increasing depth in a water body is called thermal stratification. There are three types of thermal stratifications.
- Epilimnion - The upper layer of warmer water.
- Metalimnion - The middle layer with a zone of gradual decrease in temperature.
- Hypolimnion - The bottom layer of colder water.

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

- The outer bark of trees which extends to the last formed periderm is called Rhytidome.
- It is composed of multiple layers of suberized periderm, cortical and phloem tissues.
- It protects the stem against fire, water loss, invasion of insects and prevents infections by microorganisms.

44. What is Myrmecophily? (May22)

- Ants act as body guards of the plants against any disturbing agent and the plants in turn provide food and shelter to these ants. Example: Acacia and acacia ants.

45. What is seed ball? (Mar20, Mar23)

- Seed ball is an ancient Japanese technique of encasing seeds in a mixture of clay and soil humus (also in cow dung) and scattering them on to suitable ground, not planting of trees manually.

46. How is anemochory differ from zoochory?

Anemochory:

- The individual seeds or the whole fruit may be modified to help for the dispersal by wind.
- Wind dispersal of fruits and seeds is quite common in tall trees.

Zoochory:

- Birds and mammals, including human beings play an efficient and important role in the dispersal of fruit and seeds.

47. What is co evolution? (Aug21, Mar23)

- The interaction between organisms, when continues for generations, involves reciprocal changes in genetic and morphological characters of both organisms.

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

- Based on the temperature prevailing in an area, Raunkiaer classified the world's vegetation into the following four types.
- **Hekistotherms:** (Temperature less than 70°C) Where very low temperature prevails and the dominant vegetation is alpine vegetation.
- **Microtherms:** (Temperature ranges between 70°C and 170°C) Where low temperature prevails and the dominant vegetation is mixed coniferous forest.
- **Mesotherms:** (Temperature ranges between 170°C and 240°C) Where high temperature alternates with low temperature and the dominant vegetation is tropical deciduous forest.
- **Megatherms:** (Temperature more than 240°C) Where high temperature prevails throughout the year and the dominant vegetation is tropical rain forest.

49. List out the effects of fire to plants.

- Fire has a direct lethal effect on plants.
- Burning scars are the suitable places for the entry of parasitic fungi and insects.
- It brings out the alteration of light, rainfall, nutrient cycle, fertility of soil, pH, soil flora and fauna.
- Some fungi which grow in soil of burnt areas called pyrophilous. Example: ***Pyronema confluens.***

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

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

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

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

- It is an interaction between two different species in which the smaller partner (parasite) obtains food from the larger partner (host or plant).
- **Holoparasites -** The organisms which are dependent upon the host plants for their entire nutrition are called Holoparasites. They are also called total parasites.
- Examples: Cuscuta is a total stem parasite of the host plant Acacia, Duranta and many other plants. Cuscuta even gets flower inducing hormone from its host plant.
- **Hemiparasites -** The organisms which derive only water and minerals from their host plant while synthesizing their own food by photosynthesis are called Hemiparasites. They are also called partial parasites.
- Examples: • Viscum and Loranthus are partial stem parasites. Santalum (Sandal Wood) is a partial root parasite.

52. Explain different types of hydrophytes with examples.

- Free floating hydrophytes, Examples: Eichhornia
- Rooted- floating hydrophytes, Examples: Nelumbo
- Submerged floating hydrophytes, Examples: Ceratophyllum
- Rooted -submerged hydrophytes, Examples: Hydrilla
- Amphibious hydrophytes. Examples: Ranunculus

53. Enumerate the anatomical adaptations of xerophytes. (Any 5 points)

- Presence of multilayered epidermis with heavy cuticle to prevent water loss due to transpiration.
- Hypodermis is well developed with sclerenchymatous tissues.
- Sunken shaped stomata are present only in the lower epidermis with hairs in the sunken pits.
- Scotoactive type of stomata found in succulent plants.
- Vascular bundles are well developed with several layered bundle sheath..
- Mesophyll is well differentiated into palisade and spongy parenchyma.
- In succulents the stem possesses a water storage region.

54. List out any five morphological adaptations of halophytes.

- The temperate halophytes are herbaceous but the tropical halophytes are mostly bushy.
- In addition to the normal roots, many stilt roots are developed.
- A special type of negatively geotropic roots called pneumatophores with pneumathodes to get sufficient aeration are also present. They are called breathing roots. Example: ***Avicennia***
- Presence of thick cuticle on the aerial parts of the plant body.
- Leaves are thick, entire, succulent and glossy. Some species are aphyllous (without leaves).

- Vivipary mode of seed germination is found in halophytes.

55. What are the advantages of seed dispersal? (Mar24)

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

56. Describe dispersal of fruit and seeds by animals.

Hooked fruit:

- The surface of the fruit or seeds have hooks,(Xanthium), barbs (Andropogon), spines (Aristida) by means of which they adhere to the body of animals or clothes of human beings and get dispersed.

Sticky fruits and seeds:

- Some fruits have sticky glandular hairs by which they adhere to the fur of grazing animals. Example: ***Boerhaavia*** and ***Cleome***.
- Some fruits have viscid layer which adhere to the beak of the bird which eat them and when they rub them on to the branch of the tree, they disperse and germinate. Example: Cordia and ***Alangium.***

Fleshy fruits:

- Some fleshy fruits with conspicuous colours are dispersed by human beings to distant places after consumption. Example: Mango and ***Diplocyclos.***

LESSON 7 ECOSYSTEM

1. Which of the following is not a abiotic component of the ecosystem?

a) Bacteria b) Humus c) Organic compounds d) Inorganic compounds

2. Which of the following is / are not a natural ecosystem?

a) Forest ecosystem **b) Rice field** c) Grassland ecosystem d) Desert ecosystem

3. Pond is a type of

a) forest ecosystem b) grassland ecosystem c) marine ecosystem **d) fresh water ecosystem**

4. Pond ecosystem is

a) not self sufficient and self regulating b) partially self sufficient and self regulating

c) self sufficient and not self regulating **d) self sufficient and self regulating**

5. Profundal zone is predominated by heterotrophs in a pond ecosystem, because of

a) with effective light penetration **b) no effective light penetration**

c) complete absence of light d) a and b

6. Solar energy used by green plants for photosynthesis is only

a) 2 – 8% **b) 2 – 10%** c) 3 – 10% d) 2 – 9%

7. Which of the following ecosystem has the highest primary productivity?

a) Pond ecosystem b) Lake ecosystem c) Grassland ecosystem **d) Forest ecosystem**

8. Ecosystem consists of

a) decomposers b) producers c) consumers **d) all of the above**

9. Which one is in descending order of a food chain

a) Producers ◊ Secondary consumers ◊ Primary consumers ◊ Tertiary consumers

b) Tertiary consumers ◊ Primary consumers ◊ Secondary consumers ◊ Producers

c) Tertiary consumers ◊ Secondary consumers ◊ Primary consumers ◊ Producers

d) Tertiary consumers ◊ Producers ◊ Primary consumers ◊ Secondary consumers

10. Significance of food web is / are

a) it does not maintain stability in nature b) it shows patterns of energy transfer

c) it explains species interaction **d) b and c**

11. The following diagram represents

a) pyramid of number in a grassland ecosystem b) pyramid of number in a pond ecosystem

c) pyramid of number in a forest ecosystem d) pyramid of biomass in a pond ecosystem

12. Which of the following is / are not the mechanism of decomposition

a) Eluviation b) Catabolism c) Anabolism d) Fragmentation

13. Which of the following is not a sedimentary cycle (June23)

a) Nitrogen cycle b) Phosphorous cycle c) Sulphur cycle d) Calcium cycle

14. Which of the following are not regulating services of ecosystem services

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

a) i and iii b) ii and iv **c) i and ii** d) i and iv

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

- The productivity of profundal zone will be low because of less penetration of light.

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

- Gross primary productivity (GGP) is the total amount of organic matter produced in an ecosystem by photosynthesis.
- But net primary productivity (NPP) is the proportion of energy which remains after respiration loss in the plant.
- So the gross primary productivity is more efficient than net primary productivity

17. Pyramid of energy is always upright. Give reasons. (Aug21, Mar24)

- There is a gradual decrease in energy transfer at successive tropic levels from producers to the upper levels.
- Therefore, the pyramid of energy is always upright.

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

- If all producers are removed from the ecosystem, there is no consumers. So the ecosystem is imbalance.

19. Construct the food chain with the following data. Hawk, plants, frog, snake and grass hopper.

- Plant → Grasshopper → Frog → Snake → Hawk

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

- Detritus food chain type of food chain is present in all type of ecosystems.
- Detritus → Detritivores →Small Carnivores → Top Carnivores
- **Significance:** dead organic matter of plant and animals is broken down by decomposer and then carnivores.

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

- Grassland ecosystem, Pond ecosystem is always upright.
- Forest ecosystem somewhat different because it looks spindle shaped.
- Parasitic ecosystem is inverted because there is gradual increase in the number of organisms from producer to tertiary consumer.

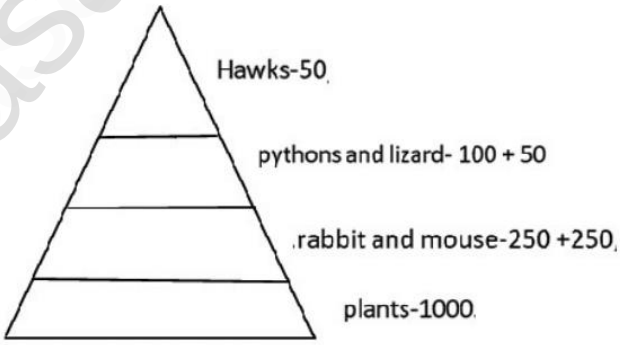
22. Generally human activities are against to the ecosystem, where as you a student how will you help to protect ecosystem? (Mar20)

- If I am a student, I will help to protect ecosystem by following methods
- Buy and use only eco-friendly products and recycle them.
- Grow more trees.
- Choose sustained farm products (vegetables, fruits, greens, etc.
- Reduce the use of natural resources.
- Recycle the waste and reduce the amount of waste you produce.
- Reduce consumption of water and electricity.

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

- Secondary succession.
- The development of a plant community in an area where an already developed community has been destroyed by some natural disturbance (Fire, flood, human activity) is known as secondary succession.

24. Draw a pyramid from following details and explain in brief. Quantities of organisms are given- Hawks-50, plants-1000. Rabbit and mouse-250 +250, pythons and lizard- 100 + 50 respectively. (May22, June23)



- There is a gradual decrease in the number of organisms in each trophic level.
- Therefore pyramid of number in grassland ecosystem is always upright.

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

- Phytoplankton stage → Submerged plant stage → Submerged free floating stage → Reed-swamp stage → Marsh meadow stage → Shrub stage → Forest stage.
- The succession in a freshwater ecosystem is also referred to as hydrosere.

Phytoplankton stage:

- In this stage development of community like blue green algae, green algae, diatoms, bacteria, etc., take place.
- The colonization of these organisms enrich the amount of organic matter and nutrients of pond due to their life activities and death.

Submerged plant stage:

- The death of decompositions of phytoplanktons leads to the formation of new substratum. Example: Chara and hydrilla.
- Later it become shallow

Submerged free floating stage:

- The depth of the pond will become almost 2-5 feet.
- The rooted hydrophytic plants and with floating large leaves start colonising the pond. Example: trapa.
- Further the pond becomes more shallow.

Reed swamp stage:

- During this stage, rooted floating plants are replaced by plants.
- Amphibious stage – It can live successfully both in aquatic and aerial environment. Example: Typha
- At the end of this stage, water level is very much reduced.

Marsh medow stage:

- They form a mat-like vegetation with the help of their much branched root system.
- This leads to an absorption and loss of large quantity of water.
- At the end of this stage, the soil becomes dry and dry shrub stage.

Shrub stage:

- In this stage areas are now invaded by terrestrial plants like shrubs and trees.
- These plants absorb large quantity of water and make the habitat dry.
- Rich flora of microorganisms produce minerals in the soil.

Forest stage:

- It is the climax community of hydrosere.
- A variety of trees invade the area and develop any one of the diverse type of vegetation. E.g: Tropical rain forest and Tropical deciduous forest.

ADDITIONAL QUESTIONS:

1. Define Ecosystem.

- A.G. Tansley (1935), who defined it as 'the system resulting from the integration of all the living and nonliving factors of the environment'.
- Odum (1962) defined ecosystem 'as the structural and functional unit of ecology'

2. Explain First law of thermodynamics.

- Energy cannot be destroyed or created. But it can be transformed from one form to another. E.g: Photosynthesis.

3. Explain Second law of thermodynamics.

- It states that energy transformation results in the reduction of the free energy of the system.
- Usually energy transformation cannot be 100% efficient E.g: Ten percent law

4. Explain Ten percent law.

- This law was proposed by Lindeman (1942). It states that during transfer of food energy from one trophic level to other, only about 10% stored at every level and rest of them (90%) is lost in respiration, decomposition and in the form of heat. Hence, the law is called ten percent law.

5. Define food chain.

- The movement of energy from producers to top carnivores is known as food chain.
- There are two types of food chain, (1) Grazing food chain and (2) Detritus food chain.

6. Define food web.

- The inter-locking pattern of a number of food chain form a web like arrangement called food web. Example: In a grazing food chain.

7. What is Pyramids of number?

- A graphical representation of the number of organisms present at each successive trophic level in an ecosystem is called pyramids of number.

8. Define fragmentation.

- The breaking down of detritus into smaller particles by detritivores like bacteria, fungi and earth worm is known as fragmentation.

9. What is PAR? (Aug22, Mar230

- The amount of light available for photosynthesis of plants is called Photosynthetically Active Radiation (PAR) which is from of 400-700 nm in wave length.

10. Explain Carbon cycle.

- The circulation of carbon between organisms and environment is known as the carbon cycle.
- Carbon is an inevitable part of all biomolecules.
- Circulation of nutrients within the ecosystem or biosphere is known as biogeochemical cycles.

11. What is succession and explain its types?

- Successive replacement of one type of plant community by the other of the same area/ place is known as plant succession.
- The development of plant community in a barren area where no community existed before is called **primary succession**.
- The development of a plant community in an area where an already developed community has been destroyed by some natural disturbance (Fire, flood, human activity) is known as **secondary succession**.

12. Differentiate Primary and secondary succession.

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

13. Explain types of succession.

- Primary Succession - Development of plant community on barren area.
- Secondary Succession - Development of plant community on disturbed area.
- Autogenic Succession - Controlled by biotic components of ecosystem.
- Allogenic Succession - Controlled by abiotic components of ecosystem.
- Autotrophic Succession - It occurs in the medium that is rich in inorganic substances.
- Heterotrophic Succession - It occurs in the medium that is rich in organic substances.

LESSON 8 ENVIRONMENTAL ISSUES

1. Which of the following would most likely help to slow down the greenhouse effect.

a) Converting tropical forests into grazing land for cattle.

b) Ensuring that all excess paper packaging is buried to ashes.

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

d) Promoting the use of private rather than public transport.

2. With respect to Eichhornia

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

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

a) Statement A is correct and Statement B is wrong. b) Both Statements A and B are correct.

c) Statement A is correct and Statement B is wrong. d) Both statements A and B are wrong.

3. Find the wrongly matched pair.

a) Endemism - Species confined to a region and not found anywhere else.

b) Hotspots - Western ghats

c) Ex-situ Conservation - Zoological parks

d) Sacred groves - Saintri hills of Rajasthan

e) Alien sp. Of India - Water hyacinth

4. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancer? (Aug22)

a) Ammonia b) Methane c) Nitrous oxide **d) Ozone**

5. One green house gas contributes 14% of total global warming and another contributes 6%. These are respectively identified as

a) N_20 and CO_2 b) CFCs and N_20 **c) CH4 and CO2** d) CH_4 and CFCS

6. One of the chief reasons among the following for the depletion in the number of species making endangered is

a) over hunting and poaching b) green house effect

c) competition and predation **d) habitat destruction**

7. Deforestation means (May22)

a) growing plants and trees in an area where there is no forest

b) growing plants and trees in an area where the forest is removed

c) growing plants and trees in a pond

d) removal of plants and trees

8. Deforestation does not lead to (Mar23)

a) Quick nutrient cycling b) soil erosion

c) alternation of local weather conditions d) Destruction of natural habitat weather conditions

9. The unit for measuring ozone thickness (Aug21, Mar24)

a) Joule b) Kilos **c) Dobson** d) Watt

10. People's movement for the protection of environment in Sirsi of Karnataka is (June23)

a) Chipko movement b) Amirtha Devi Bishwas movement

c) Appiko movement d) None of the above

11. The plants which are grown in silivpasture system are

a) Sesbania and Acacia b) Solenum and Crotalaria

c) Clitoria and Begonia d) Teak and sandal

12. What is ozone hole?

- The decline in the thickness of the ozone layer over restricted area is called Ozone hole.

13. Give four examples of plants cultivated in commercial agroforestry. (Mar23)

- Eucalyptus
- Malai vembu
- Teak
- Kadambu

14. Expand CCS. (May22)

- Carbon Capture and Storage
- It is the process of capturing and storing CO_2 which reduces the amount of CO_2 in the atmosphere with a goal of reducing global climate change.

15. How do forests help in maintaining the climate? (Mar24)

- It reduces the global warming.
- One third of the carbon di oxide released from burning fossil fuels ,is absorbed by forest every year.
- Forests are stabilizing force for the climate.
- It supports livelihood and supply goods and services that can drive sustainable growth.

16. How do sacred groves help in the conservation of biodiversity? (June23)

- These grooves provide a number of ecosystem services like, protecting water shed, fodder, medicinal plants and micro climate control.

17. Which one gas is most abundant out of the four commonest greenhouse gases? Discuss the effect of this gas on the growth of plants? (Aug21)

- Nitrous oxide is the most abundant green house gas.

Effects on plants:

- Water crisis.
- Species extinction.
- Change in flowering season.

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

- Rain water harvesting is the solution for water crisis.

Benefits:

- Reduce soil erosion.
- Reduce flood hazards.
- Improve ground water quality.
- Promote water conservation.

19. Explain afforestation with case studies.

- Afforestation is planting of trees to retrives the vegetation.

Case study:

- Jadav "Molai" Payeng – environmental activitist – the forest man of India.
- He has single-handedly planted a forest in the middle of a barren wasteland.
- He transformed Majuli, into a dense forest, home to rhinos, deer, elephants, tigers and birds.
- Sudhir kumar – vice chancellor of Jawaharlal Nehru University named him as Forest man of India in October 2013.
- In 2015 he was honored with Padma Shri Award.
- Assam Agricultural University honored him with doctorate degree for his contribution.

20. What are the effects of deforestation and benefits of agroforesty?

- Deforestation – Conversion of forested area into non forested area

Effects of deforestation:

- Loss of livelihood for forest dwellers.
- Increase global warming.
- Leads to the formation of deserts.
- Agro forestry - is an integration of trees, crops and livestock on the same plot of land.

Benefits of Agro forestry:

- It maintains O_2 and CO_2 balance.
- It maintains atmospheric temperature.
- It can be used as farm forestry.

LESSON 9 PLANT BREEDING

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.

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

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

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

5. The quickest method of plant breeding is

a) Introduction b) Selection c) Hybridization **d) Mutation breeding**

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

a) Natural Selection **b) hybridization** c) mutation d) biofertilisers

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

a) clone b) haploid c) autopolyploid d) genome

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

a) cloning b) heterosis c) selection **d) introduction**

9. Dwarfing gene of wheat is (June23)

a) pal 1 b) Atomita 1 **c) Norin 10** d) pelita 2

10. Crosses between the plants of the same variety are called (May22)

a) interspecific b) inter varietal **c) intra varietal** d) inter generic

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

12. Jaya and Ratna are the semi dwarf varieties of

a) wheat **b) rice** c) cowpea d) mustard

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

14. Match column I (crop) with column II (Corresponding disease resistant variety) and select the correct option from the given codes. (Mar24)

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

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

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

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 d. ib, iia, iiid, ivc.

19. Differentiate primary introduction from secondary introduction. (Aug21, Mar23)

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? (May22, Mar24)

- Biofertilizers are also called as microbial inoculants.
- They are efficient in fixing nitrogen, solubilising phosphate and decomposing cellulose.
- They are designed to improve the soil fertility, plant growth.
- They are ecofriendly organic agro inputs and are more efficient and cost effective than chemical fertilizers.

21. What are the different types of hybridization?

- According to the relationship between plants, the hybridization is divided into.
- **Intravarietal hybridization** - The cross between the plants of **same variety**.
- It is useful in self pollinated crops.
- **Intervarietal hybridization** - The cross between the plants belonging to **two different varieties of the same species** and is also known as intra specific hybridization.
- It is useful in improving self-pollinated as well as cross pollinated crops.
- **Interspecific hybridization** - The cross between the plants belonging to **different species belonging to the same genus** is also called intragenic hybridization.
- It is commonly used for transferring the genes.
- **Intergeneric hybridization** - The crosses are made between the plants belonging to two different genera. The disadvantages are hybrid sterility.

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

- Hybridization is the best suited type followed by plant breeders at present.

Steps in Hybridization:

Selection of Parents: Male and female plants of the desired characters are selected. It should be tested for their homozygosity.

Emasculation: It is a process of removal of anthers to prevent self pollination before anthesis (period of opening of a flower).

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

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

Harvesting seeds and raising plants:

- The pollination leads to fertilization and finally seed formation takes place. Th e seeds are grown into new generation which are called hybrid

23. Write a note on heterosis. (Sep20, June23)

- The superiority of the F1 hybrid in performance over its parents is called heterosis or hybrid vigour.
- G.H. Shull was the first scientist to use the term heterosis in 1912.
- **Euheterosis-** This is the true heterosis which is inherited and is further classified
- **Mutational Euheterosis -** Simplest type of euheterosis and results from the sheltering or eliminating of the deleterious, unfavourable oft en lethal, recessive, mutant genes by their adaptively superior dominant alleles in cross pollinated crops.
- **Balanced Euheterosis –** Well balanced gene combinations which is more adaptive to environmental conditions and agricultural usefulness.
- **Psuedoheterosis –** Also termed as luxuriance. Progeny possess superiority over parents in vegetative growth but not in yield and adaptation, usually sterile or poorly fertile.

24. List out the new breeding techniques involved in developing new traits in plant breeding. (June23)

- 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.
- 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 (cisgenesis).
- Organising processes that alter gene activity without altering the DNA itself (epigenetic methods).

ADDITIONAL QUESTION:

1. How are the microbial inoculants used to increase the soil fertility? (May22)

- They are eco friendly.
- Increase plant growth.
- Decomposing cellulose.
- Increase the biological activity.

2. Write a short on Sonora 64. (Sep20)

- Sharbati Sonora is a mutant variety of wheat, which is developed from Mexican variety (Sonora 64) by irradiating of gamma rays.

3. What is meant by SLF? (Aug22)

- Seaweed liquid fertilizer (SLF) contains cytokinin, gibberellins and auxin apart from macro and micro nutrients.
- Most seaweed based fertilizers are made from kelp (brown algae) which grows to length of 150 metres.

LESSON 10 ECONOMICALLY USEFUL PLANTS AND ENTREPRENEURIAL BOTANY

1. Consider the following statements and choose the right option.

i) Cereals are members of grass family. ii) Most of the food grains come from monocotyledon.

a) (i) is correct and (ii) is wrong **b) Both (i) and (ii) are correct**

c) (i) is wrong and (ii) is correct d) Both (i) and (ii) are wrong

2. Assertion: Vegetables are important part of healthy eating. Reason: Vegetables are succulent structures of plants with pleasant aroma and flavours.

a) Assertion is correct, Reason is wrong b) Assertion is wrong, Reason is correct

c) Both are correct and reason is the correct explanation for assertion.

d) Both are correct and reason is not the correct explanation for assertion.

3. Groundnut is native of _____

a) Philippines b) India c) North America **d) Brazil**

4. Statement A: Coffee contains caffeine

Statement B: Drinking coffee enhances cancer

a) A is correct, B is wrong b) A and B – Both are correct

c) A is wrong, B is correct d) A and B – Both are wrong

5. Tectona grandis is coming under family

a) Lamiaceae b) Fabaceae c) Dipterocaipaceae e) Ebenaceae

6. Tamarindus indica is indigenous to

a) Tropical African region b) South India, Sri Lanka

c) South America, Greece d) India alone

7. New world species of cotton

a) Gossipium arboretum b) G.herbaceum c) Both a and b **d) G.barbadense**

8. Assertion: Turmeric fights various kinds of cancer

Reason: Curcumin is an anti-oxidant present in turmeric

a) Assertion is correct, Reason is wrong b) Assertion is wrong, Reason is correct

c) Both are correct d) Both are wrong

9. Find out the correctly matched pair.

a) Rubber Shorea robusta

b) Dye Lawsonia inermis

c) Timber Cyperus papyrus

d) Pulp Hevea brasiliensis

10. Observe the following statements and pick out the right option from the following:

Statement I – Perfumes are manufactured from essential oils.

Statement II – Essential oils are formed at different parts of the plants.

a) Statement I is correct b) Statement II is correct

c) Both statements are correct d) Both statements are wrong

11. Observe the following statements and pick out the right option from the following:

Statement I: The drug sources of Siddha include plants, animal parts, ores and minerals.

Statement II: Minerals are used for preparing drugs with long shelf-life.

a) Statement I is correct b) Statement II is correct

c) Both statements are correct d) Both statements are wrong

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

a) Opium b) Curcuma **c) Marijuana** d) Andrographis

13. Which one of the following matches is correct?

a) Palmyra - Native of Brazil

b) Saccharun - Abundant in Kanyakumari

c) Steveocide - Natural sweetener

d) Palmyra sap - Fermented to give ethanol

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

a) Oryza sativa b)Triticum asetumn **c) Triticum duram** d) Zea mays

15. Write the cosmetic uses of Aloe.

- Used in skin care cosmetics.
- Used in skin tonic.
- Used in the preparation of creams.

16. What is pseudo cereal? Give an example.

- It is prepared and eaten as a whole grain, but botanical outliers from grasses. E.g: Quinoa.

17. Discuss which wood is better for making furniture.

- Teak wood – *Tectona grandis.*
- The wood does not split or crack.

18. A person got irritation while applying chemical dye. What would be your suggestion for alternative? (Aug21)

- Henna – *Lawsonia inermis* can be suggest as a dye.
- It is harmless and causes no irritation on skin.

19. Name the humors that are responsible for the health of human beings. (Aug21)

- Vatam
- Pittam
- Kapam.

20. Give definitions for organic farming? (Mar20, May22, Aug22)

- It is an alternative agricultural system in which plants are cultivated in natural ways by using biological inputs.

21. Which is called as the "King of Bitters"? Mention their medicinal importance. (Mar20)

- Nilavembu – ***Andrographis paniculata.***
- Used to treat malaria.
- Used to treat dengue.
- Used to liver diseases.

22. Differentiate bio-medicines and botanical medicines.

Bio medicines	Botanical medicines
Medicinally useful molecules obtained from plant that are marketed as a drug.	Medicinal plants which are marketed as powders or in other modified forms.

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

- Red gram – Maharashtra, Andhra Pradesh, Madhya Pradesh, Gujarat and Karnataka.
- Green gram – Maharashtra, Karnataka, Tamil Nadu and Madhya Pradesh.

24. What are millets? What are its types? Give example for each type. (Mar24)

Millets:

- Very small seeds cultivated by ancient people in Africa and Asia.
- They are gluten free.

Finger millet (Ragi) :

- Eleusine coracana (Ragi) is rich in calcium.

Uses:

- Used as a stape foods.
- Ragi malt – popular nutrient drink.
- Source of fermented beverages.

Sorghum millet (Bajra):

- *Sorghum vulgare.* Rich in calcium and iron.

Uses:

- It is fed to birds and animals.
- Source of fermented beverages.

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.

- Reduce the risk of type 2 diabetes.
- It lowers liver diseases and cancer.
- Caffeine release acetylcholine in brain, which inturn enhances efficient.

26. Enumerate the uses of turmeric.

- Colouring agent in food industries.
- Fight against various cancers.
- It has anti-bacterial anti-viral anti-fungal, anti-diabetic and anti-inflammatory activities.

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

- Traditional system of medicines.
- Institutionalized tradition
- Non Institutionalized tradition
- It is focused on healthy life style and healthy diet for maintain good health and disease reversal.

28. Write the uses of nuts you have studied.

- Used for soap making.
- Used for making vanaspathi oil.
- Rich source of phosphorus and vitamins.

29. Give an account on the role of *Jasminum* in perfuming. (June23)

- Used for making perfumed hair oils.
- It is valued for soothing, relaxing, anti-depressant qualities.

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

Keezhanelli:

- Common name : Keezhanelli
- Botanical name : *Phyllanthus amarus*
- Active principle : Phyllanthin

Medicinal uses:

- Hepato protective plant used to treat Jaundice.
- P. amarus is effective against hepatitis B.

Nilavembu:

- Common name : Nilavembu
- Botanical name : *Andrographis paniculata*
- Active principle : Andrographolides.

Medicinal uses:

- Used to treat liver disorder.
- Hepato protective plant.
- Used as Nilavembu kudineer to treat dengue.

31. Write the economic importance of rice.

- Calorie rich cereal food.
- Parched rice (pori) used as snack
- Used to make bran oil.
- Husks are used as fuel.
- Used to make vanaspathi oil.
- Bran used as cattle feed.

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

Siddha:

- It is based on the texts written by 18 siddhars.
- The entire knowledge is documented in the form of poems.
- Siddha is principally based on the pancabuta philosophy.
- The drugs of siddha include plants, animal parts, marine products and minerals.

Ayurvedha:

- The knowledge is documented by chakra, sushruta and vagbhata.
- This system use more herbs and few animal parts as drug sources.
- About 500 plants used as source of drug.

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

- These are the plants alter an individual's perceptions of mind by producing hallucination.

i) Opium poppy:

- Botanical name : *Papaver somniferum.*
- Used to induce sleep.
- Used to relieve pain.
- Morphine – analgesis in surgery

ii) : Marijuana:

- Botanical name : *Cannabis sativa.*
- Trans tetrahydro canabinal active principle.
- Used as pain killer.
- Treatment of glaucoma.
- Treatment of asthma.

34. What are the King and Queen of spices? Explain about them and their uses. (May22,)

Black pepper – King of spices:

- Botanical name – ***Piper nigrum***
- Used for preparation of sauces, soups, curry powder and pickles.
- Pepper also enhance bio absorption of medicines.
- Used in medicine as an aromatic stimulant enhance salivary and gastric secretion and also as stomachic.

Queen of spices – Cardamom:

- Botanical name – ***Elettaria cardamomum.***
- Used for flavouring confectionaries, bakery products and beverages
- Seeds are used in the preparation of curry powder, cakes and pickles.
- Chewed as a mouth freshener.

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

- Mix 120g of chillies with 110g garlic or onion.
- Make a paste by using thick paste.
- Add 500ml of warm water into it and stir them together.
- Pour the solution in to a glass container and leave it for 24 hours.
- Strain the mixture and pour the water into another container. This filtrate in the pesticide.
- Now spray your plants with the pesticide. Treat the infected plants every 4 to 5 days.

ADDITIONAL QUESTIONS:

1. Write a note on palymra tree. (March 20)

- Botanical name : ***Borassus flabellifer***
- Native : Tropical regions of Africa, Asia and New Guinea

Uses:

- Endosperm is used as a refreshing summer food.
- Exudate from inflorescence axis is collected for preparing palm sugar.
- Its sap which is used as health drink.

BIO ZOOLOGY

LESSON 1 REPRODUCTION IN ORGANISMS

1. In which type of parthenogenesis are only males produced? (Aug22, June23)

a) Arrhenotoky b) Thelytoky c) Amphitoky d) Both a and b

2. The mode of sexual reproduction in bacteria is by (Aug 21, Mar23)

a) Formation of gametes b) Endospore formation

c) Conjugation d) Zoospore formation

3. In which mode of reproduction variations are seen (May22, June23, Mar24)

a) Asexual b) Parthenogenesis **c) Sexual** d) Both a and b

4. Assertion and reasoning questions: In each of the following questions there are two statements. One is assertion (A) and other is reasoning (R).

Mark the correct answer as a. If both A and R are true and R is correct explanation for A b If both A and R are true but R is not the correct explanation for A c. If A is true but R is false d. If both A and R are false.

I. Assertion: In bee society, all the members are diploid except drones. Reason: Drones are produced by parthenogenesis.

a b c d

II. Assertion: Offsprings produced by asexual reproduction are genetically identical to the parent. Reason: Asexual reproduction involves only mitosis and no meiosis.

a b c d

5. Name an organism where cell division is itself a mode of reproduction.

- Amoeba reproduces by fission, that is by cell division itself a mode of reproduction.

6. Name the phenomenon where the female gamete directly develops into a new organism with an avian example.

- The phenomenon is Parthenogenesis.
- Turkey is the bird in which the female gamete directly develops into a new organism.

7. What is parthenogenesis? Give two examples from animals. (Aug21, May 22, June23)

- The egg develops into a complete individual without fertilization is known as parthenogenesis. ™ Example: Honeybees and Turkey.

8. Which type of reproduction in effective Asexual or sexual and why?

- Sexual reproduction is more effective than asexual reproduction.
- In asexual reproduction there is no variation.

- In sexual reproduction due to fusion of two gametes, variation is found.

9. The unicellular organisms which reproduce by binary fission are considered immortal. Justify?

- Amoeba is an unicellular organism, which is considered as immortal.
- The parental amoeba mitotically divides into two daughter amoebae.

10. Why is the offspring formed by asexual reproduction referred as a clone?

- The offsprings formed by asexual reproduction is genetically identical to the parent.
- They can also be referred as a clone.
- Clone is the exact copy of an organism which it is developed.

11. Give reasons for the following :

a) Some organisms like honey bees are called parthenogenetic animals.

b) A male honey bee has 16 chromosomes where as its female has 32 chromosomes. (Sep20, June23)

- Organisms like honey bees can reproduce without fertilization.

b)

- Male honey bees are formed without fertilization (i.e) Egg alone.
- Female honey bees are formed fertilization (i.e) Fusion of male and female gamete.
- That is why male has 16 chromosomes in the egg
- The female is diploid having 32 chromosomes, 16 from male and 16 from female.

12. Differentiate between the following:

a) External and internal fertilization (June23, Mar24)

b) Regeneration in lizard and planria

External fertilization	Internal Fertilization
the fusion of male and female gametes takes place outside the body of female organisms in the water medium.	The fusion of male and female gametes takes place within the body of female organisms.
E.g: fish	E.g: Reptiles

Regenration in lizard	Regeneration in planaria
It is epimorphosis type of regeneration	It is morphallaxis type of regeneration
It is replacement of the lost part	New planaria can develop from a small fragment of it
It is restorative regeneration	The developed planaria will be an active individual.

13. How is juvenile phase different from reproductive phase? (Mar23)

Juvenile Phase:

- It is the period of growth between the birth of the individual and reproductive maturity.
- The juvenile stage of certain organisms are ; Insects – Larva ; Cow – Calf ; Cat – Kitten

Reproductive Phase:

- The period in which the organisms are able to reproduce.
- Each organism's breeding time differs.
- If they reproduce at the particular period of the year it is called **seasonal breeders.** (Eg.) Birds.
- If they are able to reproduce throughout their sexual maturity it is known as **continuous breeders**. (Eg.) Poultry and Rabbit.

14. Explain the different types of syngamy in living organisms? (Mar24)

Type of syngamy	Definition	Example
Autogamy	The male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote.	Paramecium
Exogamy	The male and female gametes are produced by different parents and they fuse to form a zygote.	Human
Hologamy	Lower organisms, sometimes the entire mature organisms do not form gametes but they themselves behave as gametes.	Trichonympha
Paedogamy	It is the sexual union of young individuals produced immediately after the division of the adult parent cell by mitosis.	Actinophrys
Merogamy	The fusion of small sized and morphologically different takes place.	Protozoa
Isogamy	The fusion of morphological and physiological identical gametes.	Monocystis
Anisogamy	The fusion of dissimilar gametes is called anisogamy	Vertebrates

ADDITIONAL QUESTIONS:

1. Define Parthenogenesis. What are its types. (Mar24)

- Development of an egg into a complete individual without fertilization is known as parthenogenesis.
- In certain animals, parthenogenesis occurs regularly, constantly and naturally in their life cycle and is known as natural parthenogenesis.
- In artificial parthenogenesis the unfertilized egg (ovum) is induced to develop into a complete individual by physical or chemical stimuli. e.g., Annelid and seaurchin eggs.

2. What is regeneration? Explain its types. (Mar20, Mar23)

- Regeneration is regrowth in the injured region.
- There are two types morphallaxis and epimorphosis.
- Morphallaxis: The whole body grows from a small fragment. E.g: *Hydra* and *planaria.*
- Epimorphosis: It is the replacement of lost body parts. E.g: Star fish, Wall lizard.

3. Classify fertilization based upon the place of occurrence.(Aug21)

- Depending upon place where the fertilization takes place, it is of two types.
- Internal fertilization: The fusion of male and female gametes takes place outside the body of female organisms in the water medium. E.g: Fish
- External Fertilization: The fusion of male and female gametes takes place within the body of female organisms. E.g: Reptiles.

4. what is senescent phase? (May22)

- Senescent phase begins at the end of reproduction phase when degeneration sets is the structure and functioning of the body.

5. Define – plasmotomy? (Mar23)

- It is the division of multinucleated parent into many multinucleate daughter individuals.
- Nuclear division occurs later to maintain normal number of nuclei. E.g: *Pelomyxa, opaline*.

LESSON 2 HUMAN REPRODUCTION

1. The mature sperms are stored in the (Aug21, May22)

a. Seminiferous tubules b.Vas deferens **c. Epididymis** d. Seminal vesicle

2. The male sex hormone testosterone is secreted from (Mar23, June23)

a. Sertoli cells **b. Leydig cell** c. Epididymis d. Prostate gland

3. The glandular accessory organ which produces the largest proportion of semen is

a. Seminal vesicle b. Bulbourethral gland c. Prostate gland d. Mucous gland

4. The male homologue of the female clitoris is

a. Scrotum **b. Penis** c. Urethra d.Testis

5. The site of embryo implantation is the (Aug22)

a. Uterus b. Peritoneal cavity c. Vagina d. Fallopian tube

6. The foetal membrane that forms the basis of the umbilical cord is

a. Allantois b. Amnion c. Chorion d. Yolk sac

7. The most important hormone in intiating and maintaining lactation after birth is

a. Oestrogen b. FSH **c. Prolactin** d. Oxytocin

8. Mammalian egg is

a. Mesolecithal and non cleidoic b. Microlecithal and non cleidoic

c. Alecithal and non cleidoic d. Alecithal and cleidoic

9. The process which the sperm undergoes before penetrating the ovum is (Aug21)

a. Spermiation b. Cortical reaction c. Spermiogenesis **d. Capacitation**

10. The milk secreted by the mammary glands soon after child birth is called

a. Mucous **b. Colostrum** c. Lactose d. Sucrose

11. Colostrum is rich in (Mar23, June23, Mar24)

a. Ig E **b. Ig A** c. Ig D d. Ig M

12. The Androgen Binding Protein (ABP) is produced by (Aug22, Mar24)

a. Leydig cells b. Hypothalamus **c. Sertoli cells** d. Pituitary gland

13. Find the wrongly matched pair (Sep20)

a. Bleeding phase - fall in oestrogen and progesterone

b. Follicular phase - rise in oestrogen

c. Luteal phase - rise in FSH level

d. Ovulatory phase - LH surge

Answer the following type of questions Assertion (A) and Reason (R)

a. A and R are true, R is the correct explanation of A

b. A and R are true, R is not the correct explanation of A

c. A is true, R is false

d. Both A and R are false

14. A – In human male, testes are extra abdominal and lie in scrotal sacs.

R – Scrotum acts as thermoregulator and keeps temperature lower by 2^{o}C for normal sperm production .

(a) A and R are true, R is the correct explanation of A

15. A – Ovulation is the release of ovum from the Graafian follicle.

R – It occurs during the follicular phase of the menstrual cycle.

(c) A is true, R is false

16. A – Head of the sperm consists of acrosome and mitochondria.

R – Acrosome contains spiral rows of mitochondria.

(d) Both A and R are false

17. Mention the differences between spermiogenesis and spermatogenesis. (Aug22, Mar23, Mar24)

Spermiogenesis	Spermatogenesis
It is the process of formation of haploid s spermatozoa from germinal cells.	It is the process of differentiation of spermatozoon from a spermatid.
It involves conversion of a diploid structure into haploid structures	It changes a haploid structure into another haploid structure.
A spermatogonium forms four spermatozoa.	Here a spermatid forms a single spermatozoan

18. At what stage of development are the gametes formed in new born male and female?

- Production and maturation of gametes will take place after puberty (Secondary sexual maturity)

19. Expand the acronyms a. FSH b. LH c. hCG d. hPL

a. FSH - Follicle Stimulating Hormone

b. LH - Lutenizing Hormone

c. HCG - Human Chorionic Gonadotropin

d. HPL - Human Placental Lactogen

20. How is polyspermy avoided in humans?

- Once fertilisation is happened cortical granules from the cytoplasm of the ovum form a barrier called the fertilisation membrane around the ovum.
- This preventing further penetration of other sperms. Thus polyspermy is prevented.

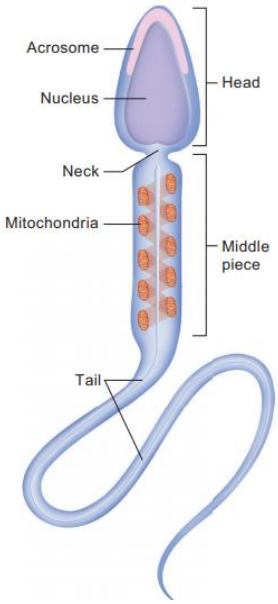
21. What is colostrum? Write its significance. (Mar20)

- Colostrum, a nutrient rich fluid produced by the human female immediately after giving birth, is loaded with immune, growth and tissue repair factors.
- It acts as a natural antimicrobial agent to actively stimulate the maturation of the infant's immune system.

22. Placenta is an endocrine tissue. Justify. (Mar20, Mar24)

- During pregnancy, the placenta acts as a temporary endocrine gland and produces hormones.
- 1. Human Chorionic Gonadotropin (hCG),
- 2. Human Chorionic Somatomammotropin (hCS) or human Placental Lactogen (hPL),
- 3. Oestrogens, progesterone and relaxin.

23. Draw a labeled sketch of a spermatozoan. (Sep20, Aug21, Aug22, Mar23, June24)



- The human sperm is microscopic, flagellate and motile gamete.
- **Body** composed of head, neck and tail.
- The head comprises acrosome and nucleus.
- Acrosome present at the tip of the nucleus.
- Acrosome contains hyarulonidase enzyme.
- **Neck** present between head and the middle piece.
- Middle piece contains mitochondria spirally twisted around the axial filament called mitochondrial spiral or nebenkern.
- **Tail** is the longest part and is slender and tapering.
- It is formed of a central axial filament or axonema and an outer protoplasmic sheath.

24. What is inhibin? State its functions. (Aug21)

- Inhibin is secreted by the sertoli cells.
- Function - negative feedback control of sperm production.

25. Mention the importance of the position of the testes in humans.

- Testes present inside scrotal sac of skin that hangs outside the abdominal cavity.
- The scrotum acts as a thermoregulator for spermatogenesis.

26. What is the composition of semen?

- Citrate
- Enzymes
- Antigens
- Fructose sugar

- Ascorbic acid
- Prostaglandins
- Vesiculase (a coagulation enzyme)

27. Explain the process of fertilization and implantation of the fertilized ovum. (Sep20)

- Fertilization occurs when a haploid sperm fuses with a haploid ovum to form a diploid fertilized egg.
- The proteolytic enzyme hyaluronidase presents in the acrosome of sperm.
- It hydrolyses the corona radiata and zonapellucida and enters into the ovum. This is called acrosomal reaction.
- Once fertilization occurs the cortical granules form a barrier the fertilisation membrane which prevents the further entry of sperms.
- **Implantation:** After 72 hours of fertilisation forms a cluster of 16 celled structure morula is formed.
- The embryo takes 4-5 days to move through the fallopian tube and gets implanted in the uterine wall. At this point the embryo becomes a hollow ball of 100 cells called blastocyst.
- This contains a single layer of large flattened cells called trophoblast and a small clusters of 20-30 rounded inner cell mass.
- The inner cell mass of blastocyst develops into the embryo and embedded in the endometrium of the uterus. This process is called implantation.

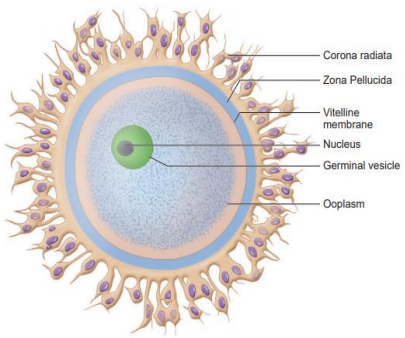
28. Define gametogenesis. (Aug22, June23)

- Gametogenesis is the process of formation of gametes.
- Sperms and ovum from testes and ovary respectively.

29. Describe the structure of the human ovum with a neat labelled diagram. (Sep20, May22, Aug21, Aug22, Mar24)

Structure of ovum

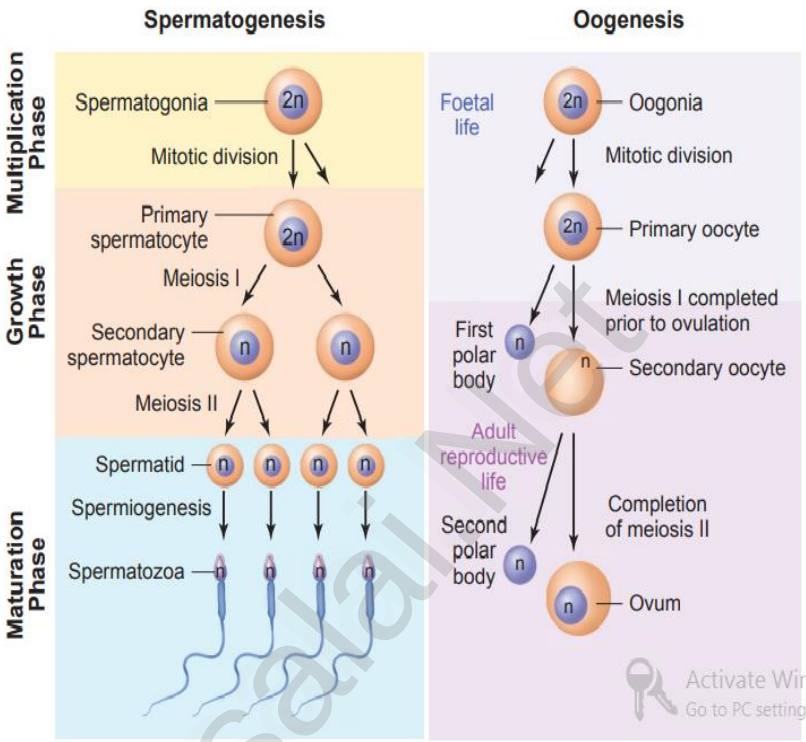
- Human ovum is non-cleidoic (without shell), alecithal (no yolk) and microscopic in nature.
- Its cytoplasm called ooplasm contains a large nucleus called the germinal vesicle.
- The ovum is surrounded by
- 1. Inner thin transparent vitelline membrane,
- 2. Middle thick zona pellucida.
- 3. Outer thick coat of follicular cells called corona radiata.



- Between the vitelline membrane and zona pellucida there is a narrow perivitelline space.

30. Give a schematic representation of spermatogenesis and oogenesis in humans. (Aug22)

- **Gametogenesis** - Process of formation of male or female gametes.
- **Spermatogenesis** - Process of formation of male gamete (Sperm).
- **Oogenesis** - Process of formation of female gamete (Ovum).



31. Explain the various phases of the menstrual cycle. (Mar23)

- The cycle of events starting from one menstrual period till the next one is called the menstrual cycle during which cyclic changes occurs in the endometrium every month.
- It occurs in every 28 or 29 days.
- Cyclic menstruation indicates normal reproductive phase.

MENSTRUAL PHASE:

- It lasts for 3 to 5 days.
- Menstrual flow is due to the breakdown of endometrial lining of the uterus, and its blood vessels due to decline in the level of progesterone and oestrogen.
- Menstruation occurs only if the released ovum is not fertilized.
- Absence of menstruation may be an indicator of pregnancy.

FOLLICULAR OR PROLIFERATIVE PHASE:

- The follicular phase extends from the 5th day of the cycle until the time of ovulation.
- The primary follicle in the ovary grows to become a fully mature Graafian follicle
- The endometrium regenerates through proliferation.
- These changes in the ovary and the uterus are induced by the secretion of gonadotropins like FSH and LH.

- It stimulates follicular development and secretion of oestrogen by the follicle cells.

OVULATORY PHASE: (March 2020)

- Both LH and FSH attain peak level in the middle of the cycle (about the 14th day).
- Maximum secretion of LH during the mid cycle called LH surge induces the
- **Ovulation** - Rupture of the Graafian follicle and the release of the ovum (secondary oocyte) from the ovary wall into the peritoneal cavity.

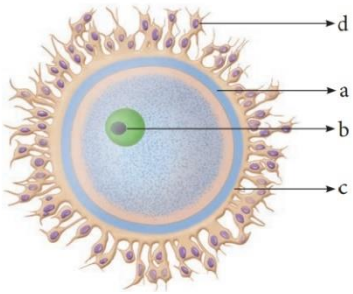
LUTEAL OR SECRETORY PHASE:

- During luteal phase, the remaining part of the Graafian follicle is transformed into a transitory endocrine gland called corpus luteum.
- The corpus luteum secretes large amount of progesterone which is essential for the maintenance of the endometrium.
- The uterine wall secretes nutritious fluid in the uterus for the foetus. So, this phase is also called as secretory phase.
- In the absence of fertilisation, the corpus luteum degenerates completely and leaves a scar tissue called corpus albicans.
- It also initiates the disintegration of the endometrium leading to menstruation, marking the next cycle.

32. Explain the role of oxytocin and relaxin in parturition and lactation. (Mar20)

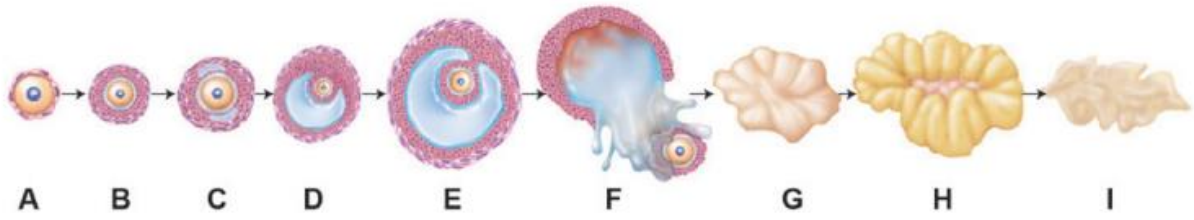
- **Relaxin -** It promotes parturition by relaxing the pelvic joints and by dilatation of the cervix with continued powerful contractions.
- **Oxytocin** - It causes the "Let-Down" reflex-the actual ejection of milk from the alveoli of the mammary glands.

33. Identify the given image and label its parts marked as a, b, c and d



- **A - Corona radiata**
- **B - Zona pellucida**
- **C - Nucleus**
- **D - Ooplasm**

34. The following is the illustration of the sequence of ovarian events (a-i) in a human female.



a) Identify the figure that illustrates ovulation and mention the stage of oogenesis it represents.

- It represents the ovulatory stage of oogenesis – Ovulation

b) Name the ovarian hormone and the pituitary hormone that have caused the above-mentioned events.

- Ovarian hormone - Progesterone
- Pituitary hormone - Follicle stimulating hormone(FSH) and luteinizing hormone (LH)

c) Explain the changes that occurs in the uterus simultaneously in anticipation.

- The endometrium of the uterus gets thickened and blood supply to the endometrium increases.

d) Write the difference between C and H.

- C – Secondary follicle, surrounded by granulosa cells.
- H – Corpus luteum, granulosa cells are absent.

ADDITIONAL QUESTIONS:

1. What is let down reflex? (Mar20)

- The hormone oxytocin brings about the let down refles which is the actual ejection of milk from the alveoli of the mammary gland.

2. What is Ectopic pregnancy? (Sep20)

- If the fertilized ovum is implanted outside the uterus its results in ectopic pregnancy.
- Consequences: About 95% ectopic pregnancies occur in the fallopian tube.
- The growth of the embryo may cause internal bleeding.
- Infection and in some cases even death due to rupture of the fallopian tube.

3. What are the three layers of uterine wall? (Mar23)

- Pericardium - Outer thin layer
- Myocardium - Middle thick Muscular layer
- Endometrium - Inner glandular layer

LESSON 3 REPRODUCTIVE HEALTH

1. Which of the following is correct regarding HIV, hepatitis B, gonorrhoea and trichomoniasis?

(a) Gonorrhoea is a STD whereas others are not.

(b) Trichomoniasis is a viral disease whereas others are bacterial.

(c) HIV is a pathogen whereas others are diseases.

(d) Hepatitis B is eradicated completely whereas others are not.

2. Which one of the following groups includes sexually transmitted diseases caused by bacteria only? (June23)

(a) Syphilis, gonorrhoea and candidiasis

(b) Syphilis, chlamydiasis and gonorrhoea

(c) Syphilis, gonorrhoea and trichomoniasis

(d) Syphilis, trichomoniasis and pediculosis

3. Identify the correct statements from the following

(a) Chlamydiasis is a viral disease.

(b) Gonorrhoea is caused by a spirochaete bacterium, Treponema palladium.

(c) The incubation period for syphilis is is 2 to 14 days in males and 7 to 21 days in females.

(d) Both syphilis and gonorrhoea are easily cured with antibiotics.

4. A contraceptive pill prevents ovulation by (May22, June23)

(a) blocking fallopian tube

(b) inhibiting release of FSH and LH

(c) stimulating release of FSH and LH

(d) causing immediate degeneration of released ovum

5. The approach which does not give the defined action of contraceptive is

(a)	Hormonal contraceptive	Prevents entry of sperms, prevent ovulation and fertilization
(b)	**Vasectomy**	**Prevents spermatogenesis**
(c)	Barrier method	Prevents fertilization
(d)	Intra uterine device	Increases phagocytosis of sperms, suppresses sperm motility and fertilizing capacity of sperms

6. Read the given statements and select the correct option.

Statement 1: Diaphragms, cervical caps and vaults are made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus.

Statement 2: They are chemical barriers of conception and are reusable.

(a) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1

(b) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.

(c) Statement 1 is correct but statement 2 is incorrect.

(d) Both statements 1 and 2 are incorrect

7. Match column I with column II and select the correct option from the codes given below.

Column I	Column II
A. Copper releasing IUD	(i) LNG-20
B. Hormone releasing	(ii) Lippes loop IUD
C. Non medicated IUD	(iii) Saheli
D. Mini pills	(iv) Multiload-375

(a) A-(iv), B-(ii), C-(i), D-(iii)
(b) A-(iv), B-(i), C-(iii), D-(ii)
(c) A-(i), B-(iv), C-(ii), D-(iii)
(d) A-(iv), B-(i), C-(ii), D-(iii) **(Mar20)**

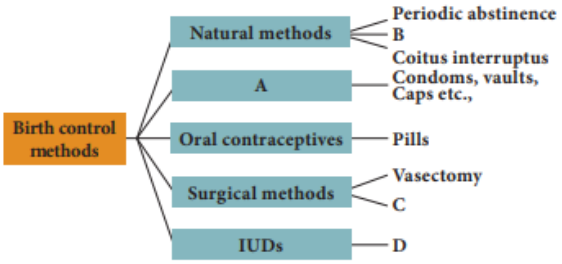
8. Select the incorrect action of hormonal contraceptive pills from the following (Sep20)

(a) Inhibition of spermatogenesis. (b) Inhibition of ovulation.

(c) Changes in cervical mucus impairing its ability to allow passage and transport of sperms.

(d) Alteration in uterine endometrium to make it unsuitable for implantation

9. Select the correct term from the bracket and complete the given branching tree



(Barriers, Lactational amenorrhoea, CuT, Tubectomy)

A	- Barriers
B	- Lactational amenorrhoea
C	- Tubectomy
D	- CuT

10. Correct the following statements

a) Transfer of an ovum collected from donor into the fallopian tube is called ZIFT.

- Transfer of an ovum collected from donor into the fallopian tube is called **GIFT.**

b) Transfering of an embryo with more than 8 blastomeres into uterus is called GIFT.

- Transfering of an embryo with more than 8 blastomeres into uterus is called **IUT**.

c) Multiload 375 is a hormone releasing IUD.

- Multiload 375 is a **copper** releasing IUD.

11. Which method do you suggest the couple to have a baby, if the male partner fails to inseminate the female or due to very low sperm count in the ejaculate?

- Intra-Uterine Insemination (IUI)
- In Vitro Fertilization, (IVF)
- Embryo Transfer (ET)
- Zygote Intra-Fallopian Transfer (ZIFT)
- Gamete Intra Fallopian Transfer (GIFT)
- Intra-Cytoplasmic Sperm Injection (ICSI)

12. Expand the following a) ZIFT b) ICSI

- Zygote Intra-Fallopian Transfer (ZIFT)
- Intra-Cytoplasmic Sperm Injection (ICSI)

13. What are the strategies to be implemented in India to attain total reproductive health?

- Supply of nutritional food to the pregnant women,
- Janani Suraksha Yojana,
- Janani Shishu Suraksha Karyakaram
- Pradhan Mantri Surakshit Matritva Abhiyan

14. Differentiate foeticide and infanticide. (May22, Aug22)

Foeticide	Infanticide
Aborting the female in the mother's womb	Killing the female child after her birth

15. Describe the major STDs and their symptoms.

Name of the disease	Causative agent	Symptoms	Incubation period
Hepatitis-B	Hepatitis B virus (HBV)	Fatigue, jaundice, fever, rash and stomach pain. Liver cirrhosis and liver failure occur in the later stage	30-80 days
AIDS	Human immune deficiency virus (HIV)	Enlarged lymph nodes, prolonged fever, prolonged diarrhoea, weight reduction, night sweating.	2 to 6 weeks even more than 10 years.

16. How are STDs transmitted?

- STDs are transmitted during sexual contact with an infected partner. Eg. Person with Hepatitis-B and HIV
- They are also transferred by sharing needles, surgical instruments, with infected people, or blood transfusion or from infected mother to baby.

17. Write the preventive measures of STDs. (June23)

Preventive measures include:

- Avoid sex with unknown partner/ multiple partners
- Use condoms
- In case of doubt, consult a doctor for diagnosis and get complete treatment.

18. The procedure of GIFT involves the transfer of female gametes into the fallopain tube, can gametes be transferred to the uterus to achieve the same result? Explain.

- Transfer of gametes to the uterus will not give the same result.
- This Process includes (insemination to implantation).
- After ovulation, ovum enters the fallopian tube.
- Sperm needs to reach the ampulla and fertilise the egg.
- Uterus is the place of implantation, Fertilisation will not take place inside the uterus.
- Hence, transfer of female gamete directly into the uterus will not give the same result.

19. Amniocentesis, the foetal sex determination test, is banned in our country, Is it necessary? comment.

- Yes it is necessary.
- Amniocentesis is a prenatal technique used to diagnose chromosomal abnormalities.
- Amniocentesis is misused to find out the sex of the foetus leading to female foeticides, it is necessary.
- Hence, a legal ban on amniocentesis is necessary.

20. Explain the various barrier methods to control human population.

Barrier methods:

- In these methods, the ovum and sperm are prevented from meeting so that fertilization does not occur.

a. Chemical barrier:

- Foaming tablets, melting suppositories, jellies and creams are used as chemical agents that inactivate the sperms in the vagina.

b. Mechanical barrier:

- Condom are a thin sheath used to cover the penis in male whereas in female it is used to cover vagina and cervix just before coitus so as to prevent the entry of ejaculated semen into the female reproductive tract.
- Diaphragms, cervical caps and vaults are made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus in order to prevent the sperms from entering the uterus.

c. Hormonal barrier:

- It prevents the ovaries from releasing the ova and thickens the cervical fluid which keeps the sperm away from ovum.

Oral contraceptives:

- Pills are used to prevent ovulation by inhibiting the secretion of FSH and LH hormones. E.g: Saheli.

21. 'Healthy reproduction, legally checked birth control measures and proper family planning programmes are essential for the survival of mankind' Justify.

- Reproductive health and proper family planning programmes are highly essential for the survival of mankind.
- Family planning reduce the need for abortion especially unsafe abortion.
- By preventing unintended pregnancy, family planning prevents death of mothers and children.

ADDITIONAL QUESTION:

1. Define Surrogacy? (May 2022)

- It is a method of reproduction or an agreement where by a women agree to carry a pregnancy of another person who will become the new born children's parent after birth.

2. **Explain the various barrier methods to control human population.**

- Natural method is used to prevent meeting of sperm with ovum.

a. Periodic abstinence/rhythm method

- Ovulation occurs at about the 14th day of the menstrual cycle. Ovum survives for about two days and sperm remains alive for about 72 hours in the female reproductive tract. Coitus is to be avoided during this time.

b. Continuous abstinence

- It is the simplest and most reliable way to avoid pregnancy is not to have coitus for a defined period that facilitates conception.

c. Coitus interruptus

- It is the oldest family planning method. The male partner withdraws his penis before ejaculation, thereby preventing deposition of semen into the vagina.

d. Lactational amenorrhoea

- Menstrual cycles resume as early as 6 to 8 weeks from parturition. However, the reappearance of normal ovarian cycles may be delayed for six months during breastfeeding.
- This delay in ovarian cycles is called lactational amenorrhoea.

3. Suggest the risk factors for cervical cancer? (Mar24)

- Multiple sexual partners.
- Prolonged use of contraceptive pills.

LESSON 04 PRINCIPLES OF INHERITANCE AND VARIATION

1. Haemophilia is more common in males because it is a

a) Recessive character carried by Y-chromosome

b) Dominant character carried by Y-chromosome

c) Dominant trait carried by X-chromosome

d) Recessive trait carried by X-chromosome

2. ABO blood group in man is controlled by

a) Multiple alleles b) Lethal genes c) Sex linked genes d) Y-linked genes

3. Three children of a family have blood groups A, AB and B. What could be the genotypes of their parents?

a) $I^A I^B$ and $I^o I^o$ **b) $I^A I^o$ and $I^B I^o$** c) $I^B I^B$ and $I^A I^A$ d) $I^A I^A$ and $I^o I^o$

4. Which of the following is not correct?

a) Three or more alleles of a trait in the population are called multiple alleles.

b) A normal gene undergoes mutations to form many alleles.

c) Multiple alleles map at different loci of a chromosome.

d) A diploid organism has only two alleles out of many in the population.

5. Which of the following phenotypes in the progeny are possible from the parental combination AxB?

a) A and B only b) A,B and AB only c) AB only **d) A,B,AB and O**

6. Which of the following phenotypes is not possible in the progeny of the parental genotypic combination $I^A I^O$ X $I^A I^B$? (May22)

a) AB **b) O** c) A d) B

7. Which of the following is true about Rh factor in the offspring of a parental combination DdxDd (both Rh positive)?

a) All will be Rh positive b) Half will be Rh positive

c) About ¾ will be Rh negative **d) About one fourth will be Rh negative**

8. What can be the blood group of offspring when both parents have AB blood group? (Aug22)

a) AB only **b) A, B and AB** c) A, B, AB and O d) A and B only

9. If the childs blood group is 'O' and fathers blood group is 'A' and mother's blood group is 'B' the genotype of the parents will be

a) $I^A I^A$ and $I^B I^o$ **b) $I^A I^o$ and $I^B I^o$** c) $I^A I^o$ and $I^o I^o$ d) $I^o I^o$ and $I^B I^B$

10. XO type of sex determination and XY type of sex determination are examples of

a) Male heterogamety b) Female heterogamety c) Male homogamety d) Both (b) and (c)

11. In an accident there is great loss of blood and there is no time to analyse the blood group which blood can be safely transferred?

a) O and Rh negative b) O and Rh positive c)B and Rh negative d) AB and Rh positive

12. Father of a child is colourblind and mother is carrier for colourblindness, the probability of the child being colourblind is

a) 25% **b) 50%** c) 100% d) 75%

13. A marriage between a colourblind man and a normal woman produces

a) All carrier daughters and normal sons

b) 50% carrier daughters and 50% normal daughters

c) 50% colourblind sons and 50% normal sons

d) All carrier offsprings

14. Down's syndrome is a genetic disorder which is caused by the presence of an extra chromosome number (Mar24)

a) 20 **b) 21** c) 4 d) 23

15. Klinefelters' syndrome is characterized by a karyotype of

a) XYY b) XO c) XXX **d) XXY**

16. Females with Turners' syndrome have

a) Small uterus b) Rudimentary ovaries c) Underdeveloped breasts **d) All of these**

17. Pataus' syndrome is also referred to as (Mar23)

a) 13-Trisomy b) 18-Trisomy c) 21-Trisomy d) None of these

18. "Universal Donor" and "Universal Recipients" blood group are _____ and_____respectively

a) AB, O **b) O, AB** c) A, B d) B, A

19. ZW-ZZ system of sex determination occurs in

a) Fishes b) Reptiles c) Birds **d) All of these**

20. Co-dominant blood group is

a) A **b) AB** c) B d) O

21. Which of the following is incorrect regarding ZW-ZZ type of sex determination?

a) It occurs in birds and some reptiles

b) Females are homogametic and males are heterogametic

c) Males produce one types of gamete d) It occurs in gypsy moth

22. What is haplodiploidy?

- It is a mechanism of sex determination in honey bee called haplodiploidy.
- In this system, the sex of the offspring is determined by the number of sets of chromosomes it receives.

23. Distinguish between heterogametic and homogametic sex determination systems.

Heterogametic sex determination system	Homogametic sex determination system
Two types of gametes are produced.	Only one type of gametes are produced.
Sex chromosomes are dissimilar	Sex chromosomes are similar
These organisms are called as Heteromorphic individuals.	These organisms are called as Homomorphic individuals.

24. What is Lyonisation?

- It is an condition Where there are two or more haploid sets of X- Linked genes in each cell all but one of the genes are inactivated apparently at random and have no phenotypic expression.

25. What is criss - cross inheritance?

- This type of inheritance of recessive sex linked character from father to daughter and then from the daughter to her sons is known as criss -cross inheritance or sex linked or X-linked inheritance.

26. Why are sex linked recessive characters more common in the male human beings?

- Sex linked inherited traits are more common in males than females.
- This is because, males are hemizygous (has only one X gene)

27. What are holandric genes?

- The genes present in the differential region of Y chromosome are called Y- linked or holandric genes.
- The Y linked genes have no corresponding allele in X chromosome.

28. Mention the symptoms of Phenylketonuria.

- Symptoms of phenylketonuria include severe mental retardation, light pigmentation of skin and hair.
- Phenylpyruvic acid is excreted in the urine.

29. Mention the symptoms of Down's syndrome. (Mar20)

- Severe mental retardation,
- Defective development of the central nervous system,
- Increased separation between the eyes,
- Flattened nose,

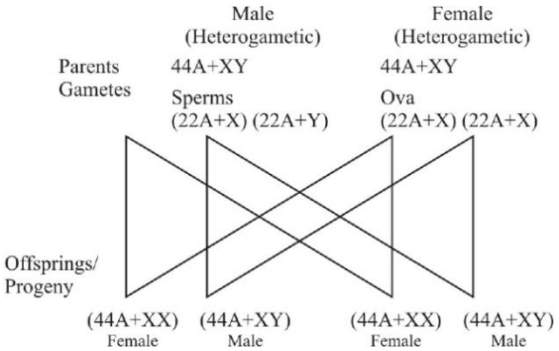
- Ears are malformed,
- Mouth is constantly open and the tongue protrudes.

30. Explain the genetic basis of ABO blood grouping man

Genotype	ABO blood group phenotype	Antigens present on red blood cell	Antibodies present in blood plasma
I^AI^A	Type A	A	Anti -B
I^Ai^o	Type A	A	Anti -B
I^BI^B	Type B	B	Anti -A
I^Bi^o	Type B	B	Anti -A
I^AI^B	Type AB	A and B	Neither Anti -A nor Anti-B
i^oi^o	Type O	Neither A nor B	Anti -A and anti - B

- Three autosomal alleles are on chromosome 9.
- These alleles determine the blood group.
- The gene for blood group is labeled as 'L' (L - Landsteiner, the discover) or 'I' (I - Isoagglutinogen, another word for antigen)
- I gene has 3 allelic forms I^A, I^B, I^O.
- I^A specifies A antigen, I^B for B antigen and I^O allele specifies no antigen.
- I^A allele produces N - acetyl galactose transferase. It can add N - acetyl galactosamine.
- I^B allele produces the enzyme galactose transferase.
- This adds galactose to the precursor (H substance)
- I^O allele produce no enzyme. It cannot add NAG (N-acetyl glucosamine) or galactose to the precursor.

31. How is sex determined in human beings?



- Human body has 23 pairs of chromosomes.
- 22 pairs are common in both male and female. These are called autosomes.
- Allosomes determine sex of humans.
- Females are homogametic (X X chromosome)
- Males are heterogametic (X Y chromosome)
- The egg fertilised by X sperm produce female.
- The egg fertilised by Y sperm produce male.

32. Explain male heterogamety.

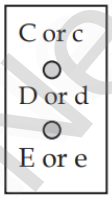
- Male producing dissimilar gametes.
- Female produce similar gametes.
- It is of two kinds XX-XO type and XX-XY type.
- E.g: Bugs, insects, cockroaches, grasshoppers.

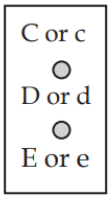
33. Brief about female heterogamety.

- Female producing dissimilar gametes.
- Male produce similar gametes (ZZ).
- It is of two kinds ZO-ZZ type ZW-ZZ type.
- It is seen in moths, butterflies, domestic chickens.

34. Give an account of genetic control of Rh factor.

- 3 different pairs of alleles are located in 3 different close loci on the homologous chromosomal pair - 1 (Cc, Dd, Ee).
- The possible genotypes are One C or c One D or d One E or e.
- For example CDE / cde CdE / cDe cde / cde CDe / CdE.
- All genotypes with dominant D produce Rh+ Phenotype
- Double recessive genotype 'dd' produce Rh- phenotype.





Wiener Hypothesis:

- Eight alleles (R^1 , R^2 , R^o , R^z , r, r^1 , r^{11}, r^y) are at a single Rh locus.
- Genotype with dominant 'R allele' (R^1 , R^2 , R^o , R^z) produce Rh^+ positive phenotype.
- Double recessive genotypes (r, r^1 , r^{11}, r^y) produce Rh^- negative phenotype.

35. Explain the mode of sex determination in honeybees.

- Haplodiploidy (Ex. Honey bee, wasp, Ants).
- It is determind by the numbers of sets of chromosomes.
- Parthenogenesis - Unfertilised eggs develop into males (or) drones.
- So males have half the number of chromosomes (haploid).
- Females have double the number (diploid).

36. What are the applications of Karyotyping?

- It helps in gender identification.
- It helps to identify the abnormalities of chromosomes like aneuploidy.
- It is also used in predicting the evolutionary relationships between species.
- Genetic diseases in human beings can be detected by this technique.
- Deletion, duplication, translocation and Non disjunction.

37. Explain the inheritance of sex linked characters in human being.

- Sex linked characters in human being:
- Inheritance of traits by genes located in sex chromosomes.
- X linked genes - The genes present in the differential region of "X" chromosome.
- Y linked genes - The genes present in the differential region of "Y" chromosome.

- Examples for X - linked inheritance are Red - green colour blindness or daltonism, haemophila and duchenne's muscular dystrophy.

ADDITIONAL QUESTIONS:

1. In the XY chromosomal system of sex determination, males have only one 'X' chromosome, whereas females have two. How does the organism compensate for this dosage differences between the sexes? (May 2022).

2. If a marriage occurs between normal man ($X^H Y^-$) and heterozygous haemophiliac woman ($X^H X^h$), what would be the result of F_1 and F_2 ? Draw flow chart. (Sep 2021)

3. A character present in grandfather goes to grandson through daughter. Draw flowchart for this pattern of Inheritance. (Mar 2020)

4. How will you prevent erythroblastosis foetolis?

- Anti D injections are given if Rh - (negative) mother and Rh + (Positive) fetus. (During 28 and 34 days).

5. What is karyotyping? (Aug22)

- It is a technique by which a complete set of chromosome is separated from a cell. These chromosomes are arranged in pairs.

6. What happens if one has inborn error of pheyl alanine metabolism?

- In this case, Phenyl alanine converts into phenyl pyruvic acid.
- The character of this disease in severe mental retardation.
- Light pigmentation of skin and hair.

7. what are multiple alleles? Describe their inheritance in human with example. (Sep20)

- Three or more alleles of a gene that control a particular trait occupy the same locus on the homologous chromosome of an organism they are called multiple allele.
- The chromosome 9 is concerned with the determination of blood group in any person.

LESSON 5 MOLECULAR GENETICS

1. Hershey and Chase experiment with bacteriophage showed that

a) Protein gets into the bacterial cells **b) DNA is the genetic material**

c) DNA contains radioactive sulphur d) Viruses undergo transformation

2. DNA and RNA are similar with respect to

a) Thymine as a nitrogen base b) A single-stranded helix shape

c) Nucleotide containing sugars, nitrogen bases and phosphates

d) The same sequence of nucleotides for the amino acid phenyl alanine

3. A mRNA molecule is produced by (Aug21, May22)

a) Replication **b) Transcription** c) Duplication d) Translation

4. The total number of nitrogenous bases in human genome is estimated to be about

a) 3.5 million b) 35000 c) 35 million **d) 3.1 billion**

5. E. coli cell grown on 15N medium are transferred to 14N medium and allowed to grow for two generations. DNA extracted from these cells is ultracentrifuged in a cesium chloride density gradient. What density distribution of DNA would you expect in this experiment?

(a) One high and one low density band. (b) One intermediate density band.

(c) One high and one intermediate density band.

(d) One low and one intermediate density band.

6. What is the basis for the difference in the synthesis of the leading and lagging strand of DNA molecules?

(a) Origin of replication occurs only at the 5' end of the molecules.

(b) DNA ligase works only in the 3' → 5' direction.

(c) DNA polymerase can join new nucleotides only to the 3' end of the growing stand.

(d) Helicases and single-strand binding proteins that work at the 5' end.

7. Which of the following is the correct sequence of event with reference to the central dogma? (Aug22, June23)

(a) Transcription, Translation, Replication (b) Transcription, Replication, Translation

(c) Duplication, Translation, Transcription **(d) Replication, Transcription, Translation**

8. Which of the following statements about DNA replication is not correct?

(a) Unwinding of DNA molecule occurs as hydrogen bonds break.

(b) Replication occurs as each base is paired with another exactly like it.

(c) Process is known as semi conservative replication because one old strand is conserved in the new molecule.

(d) Complementary base pairs are held together with hydrogen bonds.

9. Which of the following statements is not true about DNA replication in eukaryotes?

(a) Replication begins at a single origin of replication.

(b) Replication is bidirectional from the origins.

(c) Replication occurs at about 1 million base pairs per minute.

(d) There are numerous different bacterial chromosomes, with replication ocurring in each at the same time.

10. The first codon to be deciphered was _____ which codes for _____.

(a) AAA, proline (b) GGG, alanine **(c) UUU, Phenylalanine** (d)TTT,arginine

11. Meselson and Stahl's experiment proved

(a)Transduction (b) Transformation

(c) DNA is the genetic material **(d) Semi-conservative nature of DNA replication**

12. Ribosomes are composed of two subunits; the smaller subunit of a ribosome has a binding site for _____ and the larger subunit has two binding sites for two _____. (mRNA, tRNA)

13. An operon is a:

(a) Protein that suppresses gene expression

(b) Protein that accelerates gene expression

(c) Cluster of structural genes with related function

(d) Gene that switched other genes on or off

14. When lactose is present in the culture medium:

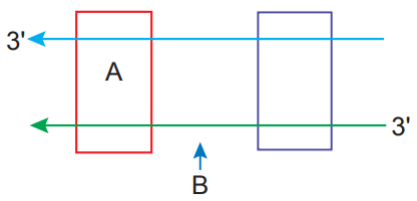
(a) Transcription of lac y, lac z, lac a genes occurs. (b) Repressor is unable to bind to the operator.

(c) Repressor is able to bind to the operator. **(d) Both (a) and (b) are correct**.

15. Give reasons: Genetic code is 'universal'.

- The genetic code is universal.
- All known living systems use nucleic acids and the same three base codons (triplet codon) direct the synthesis of protein from amino acids.

16. Name the parts marked 'A' and 'B' in the given transcription unit:



- A- Promotor
- B – Coding strand

17. Differentiate - Leading stand and lagging strand (May 2022)

Leading Strand	Lagging Strand
Leading strand	Lagging strand
DNA strand with 3' to 5'	DNA strand with 5' to 3'
Replication is continuous	Replication is discontinuous

18. Differentiate - Template strand and coding strand. (May22)

Template strand	Coding strand
It contains the nucleotide sequence as the mRNA	It contains the same nucleotide sequence of mRNA
It contains Anticodon	It contains Codons
Transcribed into Mrna	Not transcribed into mRNA.

19. Mention any two ways in which single nucleotide polymorphism (SNPs) identified in human genome can bring revolutionary change in biological and medical science.

- ETSs (Expressed sequence tag)
- Sequence annotation

20. State any three goals of the human genome project. (Mar24)

- Identifying all the genes (approximately 30,000) of human DNA.
- Determining the sequence of 3 billion chemical base pairs that make up the human DNA.
- To store these information in data bases & improve Tools for data analysis.

21. In E.coli, three enzymes β- galactosidase, permease and transacetylase are produced in the presence of lactose. Explain why the enzymes are not synthesized in the absence of lactose.

- **β-galactosidase** brings about hydrolysis of lactose to glucose and galactose.
- The enzyme **Permease** is needed for entry of lactose into the cell
- **Transacetylase** transfers acetyl group from acetyl Co A to β-galactosidase.
- If lactose is absent or lacking, the transcription of lac mRNA stops.

22. Distinguish between structural gene, regulatory gene and operator gene.

Structural gene	Regulatory gene	Operator gene
Moderately long gene	Large gene	Smaller gene
code for protein, rRNA and tRNA required by the cell	code for the production of regulatory proteins	It Prevents translation.
It functions only when receives complementary nucleotides and RNA polymerase.	Regulator gene produces a repressor or Apo repressor for blocking operator gene	Operator gene functions only when it is not blocked by repressor.

23. A low level of expression of lac operon occurs at all the windows for treatment of various genetic disorders. Justify the statement.

- A very low level of expression of lac operon has to be present in the cell all the time, otherwise lactose cannot enter the cells.

24. HGP is the windows for treatment of various genetic disorders. Justify the statement. (June23)

- Mapping the entire human genome makes it possible to compare the right human genome with a faulty one and locate at which place an alternation has been caused for a genetic disease.
- Hence, the Human Genome Project works as a windows for the treatment of various genetic diseases.

25. Why the human genome project is called a mega project? (June23)

- It took 13 years to complete.
- HGP is 25 times larger than other organisms.
- Human genome is said to have approximately 3×10^9 bp

26. From their examination of the structure of DNA, What did Watson and Crick infer about the probable mechanism of DNA replication, coding capability and mutation?

- Watson & Crick, from their examination of the structure of DNA (DNA – model) – inferred that DNA replication was semi conservative replication.
- During replication of DNA one strand act as a parental and new strand as a daughter strand.
- The two strands are complementary to each other.

27. Why tRNA is called an adapter molecule?

- The transfer RNA, (tRNA) molecule of a cell acts as a vehicle that picks up the amino acids scattered through the cytoplasm and also reads specific codes of mRNA molecules.
- It also reads specific codes of mRNA molecules.

28. What are the three structural differences between RNA and DNA?

DNA	RNA
Double stranded helix	Single stranded
Bases – Adenine, Guanine, Cytosine and Thymine.	Bases – Adenine, Guanine, Cytosine and Uracil.
Less reactive.	More reactive.
More stable	Less stable.

29. Name the anticodon recognize the following codons: AAU, CGA, UAU, and GCA.

- AAU - UUA
- CGA - GCU
- UAU - AUA
- GCA - CGU

30. a) Identify the figure given below

- Replication fork – It unwinds parental strands at the start of replication.

b) Redraw the structure as a replicating fork and label the parts

A - Template strands

B - Replication fork

C - Leading strand

D - Lagging strand

E - Okazaki fragment

c) Write the source of energy for this replication and name the enzyme involved in this process.

- **Deoxy nucleotide triphosphate** acts as substrate and also provides energy for polymerization reaction.

d) Mention the differences in the synthesis of protein, based on the polarity of the two template strands.

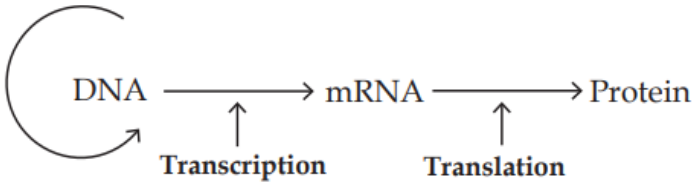
- DNA-polymerase can polymerise nucleotides only in 5'→3' direction on 3'→ 5' strand because it adds them at the 3′ end.
- Since the two strands of DNA run in antiparallel directions, the two templates provide different ends for replication.

31. If the coding sequence in a transcription unit is written as follows:

5' TGCATGCATGCATGCATGCATGCATGC 3' Write down the sequence of mRNA.

- Anti codon 3' A C G U A C G U A C G U A C G U A C G 5'.

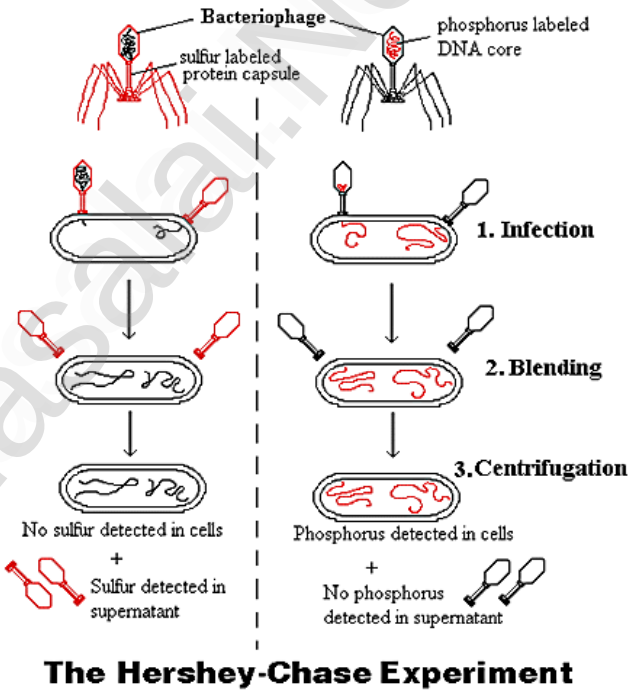
32. How is the two stage process of protein synthesis advantageous?



- Transcription – It is the process of formation of mRNA by using DNA strand as template.
- Translation – It is the process of formation of protein by using mRNA strand.

33. Why did Hershey and Chase use radioactively labelled phosphorous and sulphur only? Would they have got the same result if they use radio labelled carbon and nitrogen?

- Alfred Hershey and Martha Chase (1952) conducted experiments on bacteriophages.
- Hershey and Chase wanted to observe whether it was DNA or protein that entered the bacteria.
- Hershey and Chase designed an experiment using radioactive isotopes of Sulphur (^{35}S) and phosphorus (^{32}P)
- The phages were allowed to infect bacteria
- The bacteriophage that grew in the presence of ^{35}S had labelled proteins
- The bacteriophage that grew in the presence of ^{32}p had labelled DNA.
- Hershey and Chase mixed the labelled phages with unlabeled E. coli and allowed bacteriophages to attack and inject their genetic material.



The Hershey-Chase Experiment

- It was observed that only ^{32}P was found associated with bacterial cells and ^{35}S was in the surrounding medium and not in the bacterial cells.
- When phage progeny was studied for radioactivity, it was found that it carried only ^{32}P and not ^{35}S.
- These results clearly indicate that only DNA and not protein coat entered the bacterial cells.
- Hershey and Chase thus conclusively proved that it was DNA, not protein, which carries the hereditary information from virus to bacteria.

34. Explain the formation of a nucleosome.

- Chromatin is formed by a series of repeating units called Nucleosome.
- Kornberg proposed a model of nucleosome.
- Histone proteins – H2A, H2B, H3 and H4.
- It contains 200bp of DNA helix.
- The negatively charged DNA is wrapped around positively charged histone octamere.
- DNA is coiled on the outside of nucleosome.
- The DNA makes two complete turns around the histone octamere.

35. It is established that RNA is the first genetic material. Justify giving reasons.

- A typical cell contains about ten times as much RNA as DNA.
- The high RNA content is mainly due to the variety of roles played by RNA in the cell.
- Fraenkel-Conrat and Singer (1957) first demonstrated that RNA is the genetic material in RNA containing viruses like TMV (Tobacco Mosaic Virus).
- The term 'RNA world' first used by Walter Gilbert in 1986, hypothesizes RNA as the first genetic material on earth. There is now enough evidence to suggest that essential life processes (such as metabolism, translation, splicing etc.,)
- RNA has the ability to act as both genetic material and catalyst.
- Some viruses use RNA as the genetic material.
- Andrew Fire and Craig Mellow (recipients of Nobel Prize in 2006) were of the opinion that RNA is an active ingredient in the chemistry of life.

ADDITIONAL QUESTIONS:

1. Methodologies of Human Genome Project (Mar -2020)

- Identifying all the genes that are
- Expressed as RNA or expressed sequence tags ETS.
- Sequence annotation.
- Sequence coding and non coding sequence.
- Sequence with functions.
- DNA – small fragments.
- Amplification of DNA by vector.

2. What are operons? (Mar20)

- The clusters of gene with related functions are called operons.
- They usually transcribe single mRNA molecules Ecoli nearly 260 genes are grouped into 75 different operons.

3. Define Transcription. (Sep20)

- The process of copying genetic information from one strand of DNA into RNA is termed transcription.

4. Write down the salient features of Human genome project. (May 2022)

- The human genome contains 3 billion nucleotide bases.
- An average genome consists of 3000 bases.
- Genes are distributed over 24 chromosomes.
- Chromosome 19 has highest gene density and chromosome 13 and Y chromosome has lowest gene density.
- Functions of over 50 percent of the discovered genes are unknown.
- Less than 2 percent genes are code for proteins.

5. What is genetic code. (Aug22)

- Genetic code is the sequence relationship between nucleotide in genes (or mRNA) and the amino acids in the proteins they encode.

6. Which are called non sense codons in genetic code? (Mar23)

- UAA, UAG and UGA are called stop codons.

7. What are Okazaki fragments?

- The discontinuously synthesized fragments of the lagging strand.

8. Explain gene switch on and off mechanism in Ecoli. (or)
Explain the classical model of lac operon proposed by Jacob and monod (Aug21)

-

9. Explain the structure of RNA. (or) Explain the structure of RNA which plays a vital role in protein synthesis by transferring amino acids with diagram. (Mar23)

- The clover leaf model of tRNA was proposed by Robert Holley.
- It contains three arms namely DHU arm, middle arm and T Ψ C arm.
- Three arms have loops such as amino acyl binding loop, at their ends.
- In addition it also shows a small lump called variable loop or extra arm.
- The amino acid is attached to one end and the other end consists of three anticodon nucleotides.
- Four different regions of double stranded RNA are formed during the folding process.

LESSON 6 EVOLUTION

1) The first life on earth originated

a) in air b) on land **c) in water** d) on mountain

2) Who published the book "Origin of species by Natural Selection" in 1859? (Aug22)

a) Charles Darwin b) Lamarck c) Weismann d) Hugo de Vries

3) Which of the following was the contribution of Hugo de Vries? (Aug21)

a) Theory of mutation b) Theory of natural Selection

c) Theory of inheritance of acquired characters d) Germplasm theory

4) The wings of birds and butterflies is an example of

a) Adaptive radiation **b) convergent evolution** c) divergent evolution d) variation

5) The phenomenon of " Industrial Melanism" demonstrates (June23)

a) Natural selection b) induced mutation c) reproductive isolation d) geographical isolation

6) Darwin's finches are an excellent example of

a) connecting links b) seasonal migration **c) adaptive radiation** d) parasitism

7) Who proposed the Germplasm theory?

a) Darwin **b) August Weismann** c) Lamarck d) Alfred Wallace

8) The age of fossils can be determined by

a) electron microscope b) weighing the fossils

c) carbon dating d) analysis of bones

9) Fossils are generally found in

a) igneous rocks b) metamorphic rocks c) volcanic rocks **d) sedimentary rocks**

10) Evolutionary history of an organism is called

a) ancestry b) ontogeny **c) phylogeny** d) paleontology

11) The golden age of reptiles was

a) Mesozoic era b) Cenozoic era c) Paleozoic era d) Proterozoic era

12) Which period was called "Age of fishes"? (May22)

a) Permian b) Triassic **c) Devonian** d) Ordovician

13) Modern man belongs to which period?

a) Quaternary b) Cretaceous c) Silurian d) Cambrian

14) The Neanderthal man had the brain capacity of

a) 650 – 800cc b) 1200cc c) 900cc **d) 1400cc**

15) According to Darwin, the organic evolution is due to

a) Intraspecific competition **b) Interspecific competition**

c) Competition within closely related species.

d) Reduced feeding efficiency in one species due to the presence of interfering species.

16) A population will not exist in Hardy Weinberg equilibrium if

a) Individuals mate selectively b) There are no mutations

c) There is no migration d) The population is large

17) List out the major gases seems to be found in the primitive earth.

- Ammonia, methane, hydrogen and water vapour.
- UV rays from the sun split up water molecules into hydrogen and oxygen.

18) Explain the three major categories in which fossilization occur?

- Fossilization is the process by which plant and animal remains are preserved in sedimentary rocks.
- **Actual remains -** The original hard parts such as bones, teeth or shells are preserved as such in the earth's atmosphere.
- **Petrifaction –** When animals die the original portion of their body may be replaced molecule for molecule by minerals and the original substance being lost through disintegration.
- **Natural moulds and casts –** Even after disintegration, the body of an animal might leave indelible impression on the soft mud which later becomes hardened into stones.

19) Differentiate between divergent evolution and convergent evolution with one example for each. (Mar23).

Convergent evolution	Divergent evolution
Organs having different structural patterns but similar function.	Structure which are similar in origin but perform different functions.
Example: Wings of birds and insects	Example: Forelimbs of vertebrates

20) How does Hardy-Weinberg's expression (p2 +2pq+q2 =1) explain that genetic equilibrium is maintained in a population? List any four factors that can disturb the genetic equilibrium.

- Colours of Beetles - Dark grey (AA & Aa), light grey (aa)
- In a population let's say that 'A' allele has frequency (p) of 0.3 and 'a' allele has a frequency (q) of 0.7. Then p+q=1.
- If a population is in Hardy Weinberg equilibrium, the genotype frequency can be estimated by Hardy Weinberg equation.

$(p + q)^2 = p^2 + 2pq + q^2$

p^2 = frequency of AA

$2pq$ = frequency of Aa

q^2 = frequency of aa

$p = 0.3$, $q = 0.7$ then, $p^2 = (0.3)^2 = 0.09 = 9\%$ AA

$2pq = 2(0.3)(0.7) = 0.42 = 42\%$ Aa

$q^2 = (0.7)^2\ 0.49 = 49\%$ aa

Factors that can disturb the genetic equilibrium:

- No Mutation
- Random mating
- No gene flow
- Very large population size
- No natural selection.

21) Explain how mutations, natural selection and genetic drift affect Hardy Weinberg equilibrium.

Mutations:

- New mutations of an allele frequencies from one generation to the next is usually not large.

Genetic drift:

- Genetic drift is a mechanism of evolution in which allele frequencies of a population change over generation due to chance (sampling error).

Natural selection:

- It occurs when one allele (or combination of alleles of differences) makes an organism more or less fit to survive and reproduce in a given environment.
- If an allele reduces fitness, its frequencies tend to drop from one generation to the next.

22) How did Darwin explain fitness of organisms?

- Organisms struggle for food, space and mate.
- Intra specific struggle between the same species for food, space and mate.
- Inter specific struggle with different species for food and space.
- Struggle with the environment to cope with the climatic variations, flood, earthquakes, drought, etc.,

23) Mention the main objections to Darwinism. (June23)

- Darwin failed to explain the mechanism of variation.
- Darwinism explains the survival of the fittest but not the arrival of the fittest.

- He focused on small fluctuating variations that are mostly non-heritable.
- He did not distinguish between somatic and germinal variations.

24) Taking the example of Peppered moth, explain the action of natural selection. What do you call the above phenomenon?

- The above phenomenon is called industrial melanism.

Action:

- Before industrialization peppered moth both white and black coloured were common in England.
- Pre-industrialization witnessed white coloured background of the wall of the buildings hence the white coloured moths escaped from their predators.
- Post industrialization, the tree trunks became dark due to smoke and soot let out from the industries.
- The black moths camouflaged on the dark bark of the trees and the white moths were easily identified by their predators.
- Hence the dark coloured moth population was selected and their number increased when compared to the white moths.
- Nature offered positive selection pressure to the black coloured moths

25) Darwin's finches and Australian marsupials are suitable examples of adaptive radiation – Justify the statement.

- The evolutionary process which produces new species diverged from a single ancestral form becomes adapted to newly invaded habitats is called adaptive radiation.
- Darwin's finches and Australian marsupials are best examples for adaptive radiation.
- **Darwin's finches:** Darwin's finches have evolved into 14 recognized species differing in body size, beak shape and feeding behavior.
- Changes in the size and form of the beak have enabled different species to utilize different food resources such as insects, seeds, nectar from cactus flowers and blood from iguanas, all driven by Natural selection.
- Genetic variation in the ALX1 gene in the DNA of Darwin finches is associated with variation in the beak shape.
- Mild mutation in the ALX1 gene leads to phenotypic change in the shape of the beak of the Darwin finches.
- **Marsupials in Australia -** have adapted in similar way to a particular food resource, locomotory skill or climate.
- They were separated from the common ancestor more than 100 million year ago.

- Despite temporal and geographical separation, marsupials in Australia and placental mammals in North America have produced varieties of species living in similar habitats with similar ways of life.
- Their overall resemblance in shape, locomotory mode, feeding and foraging are superimposed upon different modes of reproduction.

26) Who disproved Lamarck's Theory of acquired characters? How? (Sep20, May22)

- Lamarck's "Theory of Acquired characters" was disproved by August Weismann.
- He took twenty generations of mice by cutting their tails and breeding them. All mice born were with tail.
- So he disproved that change in somatoplasm will not be transferred into next generation.
- But changes in the germplasm will be inherited.

27) How does Mutation theory of De Vries differ from Lamarck and Darwin's view in the origin of new species.

- According to de Vries, sudden and large variations were responsible for the origin of new species whereas Lamarck and Darwin believed in gradual accumulation of all variations as the causative factors in the origin of new species.

28) Explain stabilizing, directional and disruptive selection with examples.

Stabilizing or Centripetal selection:

- This type of selection operates in a stable environment.
- The organisms with average phenotypes survive whereas the extreme individuals from both the ends are eliminated.
- There is no speciation but the phenotypic stability is maintained within the population over generation.
- E.g: Sparrows that survived the storm cluster and sparrows that failed to storm cluster.

Directional selection:

- The environment which undergoes gradual change is subjected to directional selection.
- This type of selection removes the individuals from one end towards the other end of phenotypic distribution.
- E.g: Weight of both male and female sparrows.
- Females show directional selection in relation to body weight.

Disruptive selection or Centrifugal selection:

- When homogenous environment changes into heterogenous environment this type of selection is operational.

- The organism of both extremely phenotypes are selected and average phenotype are eliminated.
- Result – Splitting of population into two sub population/ species.
- It leads to the formation of two or more different species.
- E.g: Darwin's finches beak size in relation to seed size inhabiting Galapagos islands.

29) Rearrange the descent in human evolution Austrolopithecus → Homo erectus → Homo sapiens → Ramapithecus → Homo habilis.

- Ramapithecus → Austrolopithecus → Homo habilis → Homo erectus → Homo sapiens.

30) How does Neanderthal man differ from the modern man in appearance?

- Neanderthal man differ from the modern man in having semierect posture, flat cranium, sloping forehead, thin large orbits, heavy brow ridges, protruding jaws and no chin.
- They used animal hides to protect their bodies, knew the use of fire and buried their dead.

ADDITIONAL QUESTIONS:

1. Differentiate between the eating habit and brain size of Australopithecus and Ramapithecus.

Name of the Species	Eating habit	Brain size
Australopithecus	Omnivore	350 - 450 cc
Ramapithecus	Omnivore	About 500 cc

2) Mention any three similarities found common in Neanderthal man and Homo sapiens.

- They used animal hides to protect their bodies.
- They knew the use of fire.
- They buried their dead.

3. What do you know about coacervates? (Aug22)

- Large colloidal particles that precipitate out in aqueous medium. The first pre cells which gradually transformed into living cells.

4. Who coined the term Abiogenesis? (or) State the theory of spontaneous generation? (Aug22)

- Thomas Huxley coined the term Abiogenesis.
- Abiogenesis tells that living organisms originated from non-living materials.
- It occurs through stepwise chemical and molecular evolution over millions of years.

5. Differentiate Relative dating from absolute dating.

Relative dating	Absolute dating

Relative dating is used to determine a fossil by comparing it to similar rocks and fossils of known age	Absolute dating is used to determine the precise age of a fossil by using radiometric dating to measure the decay of isotopes.

6. Give the salient features of Mutation theory. (Aug21)

- Mutations or discontinuous variation are transmitted to the other generations.
- In naturally breeding populations, mutations occur from time to time.
- They are no intermediate forms, as they are fully fledged.
- They are strictly subjected to natural selection.

7. What are the assumption included in Hardy Weinberg principle? Explain them. (Mar24)

- No mutation - No new alleles are generated by mutation nor the genes get duplicated or deleted.
- Random mating - Every organism gets a chance to mate.
- No gene flow Neither individuals nor their gametes enter (immigration) or exit (emigration) the population).
- Very large population size: The population should be infinite in size.
- No natural selection: All alleles are fit to survive and reproduce.

8. Explain the evolutionary path of man. (Mar2020)

- Mammals evolved in the early Jurassic period, about 210 million years ago.

Hominid:

- Hominid evolutions occurred in Asia and Africa.
- Hominids proved that human beings are superior to other animals and efficient in making tools and culture.

Ramapithecus and Sivapithecus:

- The earliest fossils of the prehistoric man like Ramapithecus and Sivapithecus lived some 14 mya and were derived from ape like Dryopithecus.
- Dryopithecus and Ramapithecus were hairy and walked like gorillas and chimpanzees.
- He was about 1.5 metres tall with bipedal locomotion omnivorous, semi erect and lived in caves.

Homo habilis:

- He lived about 2 mya. He was probably vegetarian.
- They had bipedal locomotion and used tools made of chipped stones.

Homo eragaster and Homo erectus:

- Homo eragaster Homo erectus were the first to leave Africa.

- Human was found in Neander valley, Germany with a brain size of 1400 cc and lived between 34,000 - 1,00,000 years ago.
- They differ from the modern human in having semierect posture, heavy brow ridges, protruding jaws and no chin.

Cro - magnon:

- Cro-magnon was one of the most talked forms of modern human found from the rocks of Cro - magnon, France and is considered as the ancestor of modern Europeans.
- They are also known for their cave painting's figures on floor and walls.

Home Sapiens:

- Brain size of 1300-1600 CC.
- They are cultivating crops.
- Domesticating animals.

9. What are vestigial organs? Give an example. (Sep20)

- Remnants of functional structures of ancestors.
- They disappeared evolution due to non-utilization.
- E.g: Human vermiform appendix, Body, hair, Nictitating membrane of eye.

LESSON 07 HEALTH AND DISEASES

1. A 30 year old woman has bleedy diarrhoea for the past 14 hours, which one of the following organisms is likely to cause this illness?

a) Streptococcus pyogens b) Clostridium difficile

c) Shigella dysenteriae d) Salmonella enteritidis

2. Exo-erythrocytic schizogony of Plasmodium takes place in ------- (Mar24)

a) RBC b) Leucocytes c) Stomach **d) Liver**

3. The sporozoites of Plasmodium vivax are formed from ----------

a) Gametocytes b) Sporoblasts **c) Oocysts** d) Spores

4. Amphetamines are stimulants of the CNS, whereas barbiturates are ----

a) CNS stimulant b) both a and b c) hallucinogenic **d) CNS depressants**

5. Choose the correctly match pair. (Aug22)

a) Amphetamines - Stimulant

b) LSD - Narcotic

c) Heroin - Psychotropic

d) Benzodiazepine - Pain killer

6. The Athlete's foot disease in human is caused by------- (Mar23)

a) Bacteria **b) Fungi** c) Virus d) Protozoan

7. Cirrhosis of liver is caused by chronic intake of -----

a) Opium **b) Alcohol** c) Tobacco d) Cocaine

8. The sporozoite of the malarial parasite is present in ----

a) saliva of infected female Anopheles mosquito. b) RBC of human suffering from malaria.

c) Spleen of infected humans. d) Gut of female Anopheles mosquito.

9. Match the pathogens with respective diseases caused by them and select the correct match using the codes given below. (Sep20)

A. Leishmania donavani - i. Amoebiasis

B. Wuchereria bancrofti - ii. Kala – azar

C. Trypanosoma gambiense - iii. Sleeping sickness

D. Entamoeba histolytica - iv. Filariasis

a) A-ii, B-iv, C-iii, D-i b) A-ii, B-iv, C-i, D-iii

c) A-iii, B-i, C-ii, D-iv d) A-i, B-iv, C-iii, D-ii

10. Paratope is an

a) Antibody binding site on variable regions b) Antibody binding site on heavy regions

c) Antigen binding site on variable regions d) Antigen binding site on heavy regions

11. Allergy involves

a) IgE b) IgG c) lgA d) IgM

12. Spread of cancerous cells to distant sites is termed as

a) Metastasis b) Oncogenes c) Proto-oncogenes d)Malignant neoplasm

13. AIDS virus has

a) Single stranded RNA b) Double stranded RNA

c) Single stranded DNA d) Double stranded DNA

14. B cells that produce and release large amounts of antibody are called

a) Memory cells b) Basophils **c) Plasma cells** d) killer cells

15. Given below are some human organs. Identify one primary and one secondary lymphoid organ. Explain its role. Liver, thymus, stomach, thyroid, tonsils. (Mar20)

Name of the organ	Type of lymphoid organ	Role
Tonsils	Secondary lymphoid organ	They stop invading germs including bacteria and viruses.
Thymus	Primary lymphoid organ	One of its main secretions is the hormone thymosin. It stimulates the T cell to become mature and immunocompetent

16. Name and explain the type of barriers which involve macrophages.

- Phagocytic barriers – Monocytes, Neutrophils digest whole microorganisms.

17. What are interferons? Mention their role.

- Signalling protein released by host cell.
- Role – Antiviral defence.

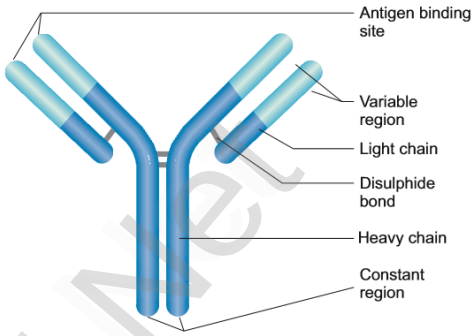
18. List out chemical alarm signals produced during inflammation.

- Serotonin
- Histamine and Prostaglandins.

19. Explain the process of replication of retrovirus after it gains entry into the human body.

- Retrovirus enters into Macrophages.
- With the help of reverse transcriptase it forms viral DNA.
- Viral DNA controls the host cell and direct to form viral particals.

20. Explain the structure of immunoglobulin with suitable diagram. (Aug21, May22, Mar23)



- Immunoglobulins is Y shaped structure.
- It is made up of four polypeptide chains.
- Heavy chains (H) – molecular weight 50000 Dalton. (Appx. 214 amino acids)
- Light chain (L) – molecular weight 25000 Dalton. (Appx. 450 amino acids)
- Both H and L chain connected by Di sulphide bond.
- Immunoglobulins have two ends N- terminal and C- terminal.
- They have two regions Variable (V) and Constant (C).

Functions:

- Agglutination
- Precipitaion
- Opsonisation.

21. What are the cells involved innate immune system?

- Monocytes
- Neutrophils
- Helper T cells and B cells.

22. What is vaccine? What are its types? (Aug21, Aug22)

- A vaccine is a biological preparation that provides active acquired immunity to a particular disease and resembles a disease causing microorganism.

First generation vaccine:

- Live attenuated vaccines use the weakened (attenuated), aged, less virulent form of the virus. E.g. Measles, Mumps.
- Killed (inactivated) vaccines are killed or inactivated by heat and other methods. E.g. Salk's polio vaccine.
- Toxoid vaccines contain a toxin or chemical secreted by the bacteria or virus. E.g: DPT vaccine

Second generation vaccine:

- Second generation vaccine contains the pure surface antigen of the pathogen. E.g.Hepatitis-B vaccine.

Third generation vaccine:

- Third generation vaccine contains the purest and the highest potency vaccines which are synthetic in generation. The latest revolution in vaccine is DNA vaccine or recombinant vaccine

23. A person is infected by HIV. How will you diagnose for AIDS?

- ELISA test detect the presence of HIV.
- Western blot is the confirmatory test.

24. Autoimmunity is a misdirected immune response. Justify. (May22, June23)

- Abnormal immune response.
- Attacks its own host cells.
- Antibodies and T cells reacts against host antigen.

25. List the causative agent, mode of transmission and symptoms for Diphtheria and Typhoid.

Diptheria:

- Causative agent – *Corynebacterium diphtheriae*
- Mode of transmission – Droplet infection.
- Symptoms – Fever, sore throat, hoareness, etc.

Typhoid:

- Causative agent – Salmonella typhi
- Mode of transmission – Contaminated water and food
- Symptoms – Fever, Headache, diarrhoea etc.

26. A patient was hospitalized with fever and chills. Merozoites were observed in her blood. What is your diagnosis?

- Appearance of merozoites in a patient blood may be an indication of malarial parasite - plasmodium.

27. (i) Write the scientific name of the filarial worm that causes filariasis.

(ii)Write the symptoms of filariasis. (May2022) (iii) How is this disease transmitted?

- **Scientific name** - *Wuchereria bancrofti*

Symptoms

- Inflammation of lymph nodes,
- The obstruction of lymph vessels.
- Inflammation of limbs, scrotum and mammary gland.

- **Transmission** - Vector transmission

28. List the common withdrawal symptoms of drugs and alcohol abuse.

- Nervousness.
- Anxiety.
- Insomnia.
- Dryness of throat.
- Mild tremors.

29. Why do you think it is not possible to produce vaccine against 'common cold'?

- Vaccines target specific pathogens.
- Cold is caused by 200 strains of viruses so it is not possible to produce vaccine against common cold.

ADDITIONAL QUESTIONS:

1. List the causative agent, mode of transmission and symptoms for Bacterial diseases.

S.no	Diseases	Causative agents	Site of infection	Mode of transmission	Symptoms
1	**Diphtheria**	*corynebacterium diptheriae*	Larynx, skin, nasal and genital passage	Droplet infection	Fever, sore throat, hoarness
2	**Typhoid**	*Salmonella typhi*	Intestine	Contamination of food and water	Severe diarrhoea and dehydration
3	**Pneumonia**	*Streptococcus pneumoniae*	Lungs	Droplet infection	Fever, cough, brown sputum
4	**Tuberculosis**	*Mycobacterium tuberculosis*	Lungs	Droplet infection	Thick mucopurulant nasal discharge

2. Write the Different types of malaria.

Sl No	Types of Malaria	Causative agent	Duration of Erythrocytic cycle
1	Tertian, benign tertian or vivax malaria	*P. vivax*	48 hours
2	Quartan malaria	*P. malariae*	72 hours
3	Mild tertian malaria	*P. ovale*	48 hours
4	Malignant tertian or quotidian malaria	*P. falciparum*	36 – 48 hours

3. Define Immunology.

- Study of immune system.
- This system protects body from various infective agents.

4. List the causative agent, mode of transmission and symptoms for viral diseases.

S.no	Diseases	Causative agents	Site of infection	Mode of transmission	Symptoms
1	**AIDS**	*HIV*	Immune system	Sexually transmitted disease	Prolonged fever, cancer, diabetes
2	**Common cold**	*Rhino viruses*	Respiratory tract	Droplet infection	Headache, sore throat, cough
3	**Viral hepatitis**	*Hepaitis b virus*	Liver	Blood transfusion, STD.	Jaundice, nausea, fever
4	**Chicken pox**	*Varicella zoster virus*	Respiratory tract, skin and nervous system	Droplet infection and direct contact	Mild fever, rash, itchy skin.

5. Differentiate Active and Passive Immunity. (March 2020)

Active Immunity	Passive immunity
Produced actively by host's immune system	No active host participation
Immunological memory present	Immunological memory Absent
More effective	Less effective

6. What are lymphoid organs.

- The organs involved in the origin, maturation and proliferation of lymphocytes are called lymphoid organs. E.g: Thymus, Bone marrow.

7. Expand MALT, BALT and GALT.

- MALT - Mucosa Associated lymphoid Organ
- BALT - Bronchial Associated lymphoid Organ
- GALT - Gut Associated lymphoid Organ

8. Define Antigen.

- A molecule which generates an immune response.
- A molecule which reacts with antibody.

9. Explain the Structure of HIV.

- Human Immunodeficiency Virus
- Spherical shape.
- 100 – 200 nm in diameter.
- Contains two large single stranded RNAs with reverse transcriptase.
- Glycoprotein – gp120 and gp41.
- Contains enzymes like protease and ribonuclease.

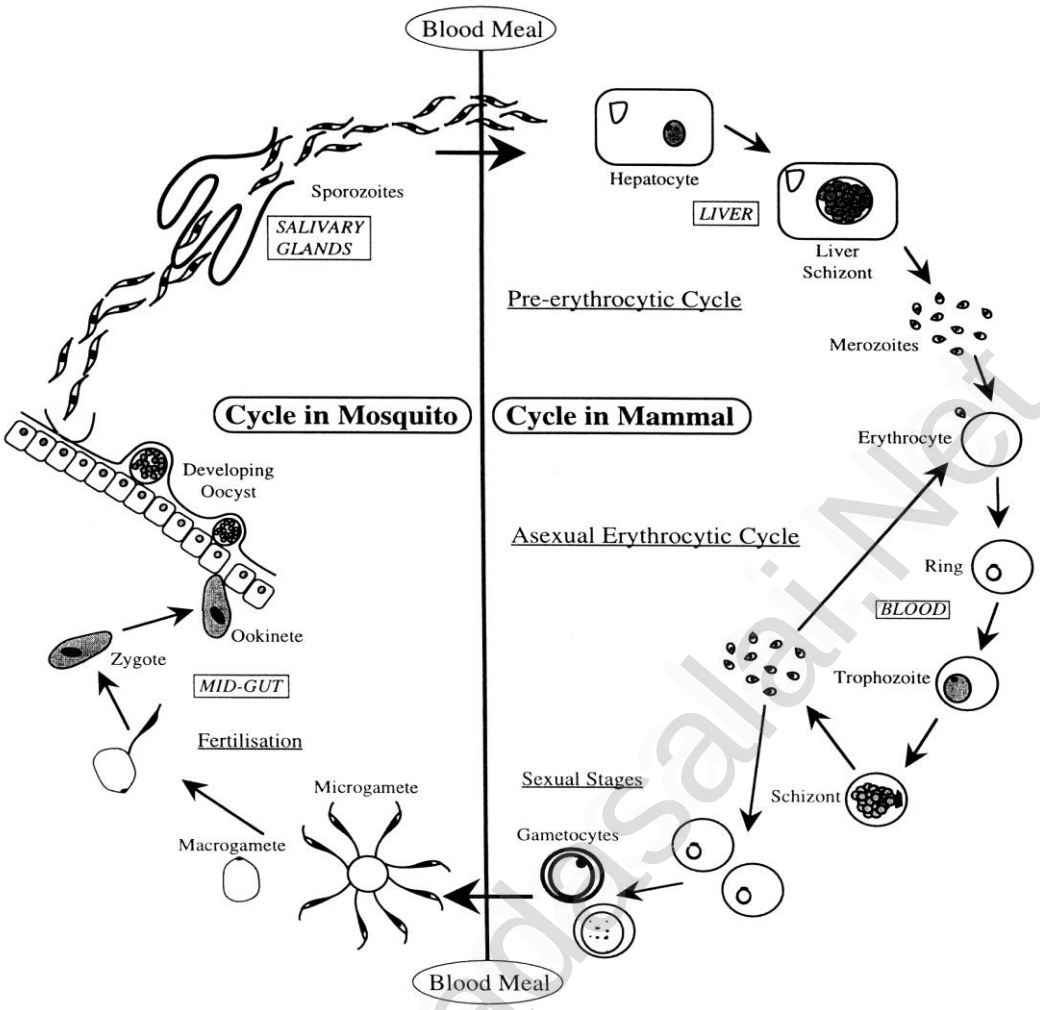
10. Differentiate Normal cell and Cancer cell.

Normal cell	Cancer cell
Small in size	Large in size
Small number of dividing cells	Large number of dividing cells.
Organised cell arrangement	Disorganised cell arrangements.

11. Name some classification of drugs and its effects. (Mar24)

Group	Drugs	Effects
Stimulants	Nicotine, tobacco	Accelerate the activity of brain.
Hallucinogens	Phencyclidine	Affects the cardiovascular disease system
Depressants	Alcohol, Barbiturates	Slow down the activity of the brain
Narcotic	Opium / Morphine	Act as depressants on the central nervous system
Stimulants, Depressants, Hallucinogens	Bhang (Marijuana), Ganja	Stimulating action on the CNS and affects the cardiovascular system.

12. Explain the life cycle of plasmodium.



13. Name any four human viral diseases? (Mar23)

- Pneumotropic diseases – E.g: Influenza
- Dermotropic diseases – E.g: Chicken pox
- Viscerotropic diseases – E.g: Dengue fever
- Neurotropic diseases – E.g: Rabies

14. Name the hormone secreted by thymus and write any 2 functions. (Mar20)

- Thymulin, Thymosin and Thymopoietin.
- They educate the T cells to become immunocompetent.

15. If immunological surveillance is effective, cancer should not occur. Justify. (Sep20)

- The efficiency of the surveillance mechanism reduces either as a result of ageing or due to congenital or acquired immune deficiencies, leads to increased incidence of cancer.

LESSON 8 MICROBES IN HUMAN WELFARE

1. Which of the following microorganism is used for production of citric acid in industries?

a) Lactobacillus bulgaris b) Penicillium citrinum

c) Aspergillus niger d) Rhizopus nigricans

2. Which of the following pair is correctly matched for the product produced by them?

a) Acetobacter aceti -Antibiotics

b) Methanobacterium -Lactic acid

c) Penicilium notatum -Acetic acid

d) Saccharomyces cerevisiae - Ethanol

3. The most common substrate used in distilleries for the production of ethanol is_____

a) Soyameal b) Groundgram **c) Molasses** d) Corn meal

4. Cyclosporin – A is an immunosuppressive drug produced from _____ (May22)

a) Aspergillus niger b) Manascus purpureus

c) Penicillium notatum **d) Trichoderma polysporum**

5. CO_2 is not released during

a) Alcoholic fermentation **b) Lactate fermentation**

c) Aerobic respiration in animals d) Aerobic respiration in plants

6. The purpose of biological treatment of waste water is to _____

a) Reduce BOD b) Increase BOD

c) Reduce sedimentation d) Increase sedimentation

7. The gases produced in anaerobic sludge digesters are (Sep20)

a) Methane, oxygen and hydrogen sulphide.

b) Hydrogen sulphide, methane and sulphur dioxide.

c) Hydrogen sulphide, nitrogen and methane.

d) Methane, hydrogen sulphide and CO_2

8. How is milk converted into curd? Explain the process of curd formation.

- Lactic acid bacteria (LAB) responsible for Convertion of milk into curd.
- It digests the milk protein casein under $\leq 40^oC$.
- Process - A small amount of curd added to fresh milk as a starter or inoculum contains millions of Lactobacilli, which under suitable temperature ($\leq 40^o$ C) multiply and convert milk into curd.

9. Give any two bioactive molecules produced by microbes and state their uses.

Molecules	Binomial name	Uses
Cyclosporin A	***Trichoderma polysporum***	Against Anti-inflammatory, Anti-fungal and Anti-parasitic
Statins	***Monascus purpureus***	It lowers blood cholesterol levels. It inhibits the enzyme responsible for the formation of cholesterol.

10. Define the following terms:

(a) Antibiotics

- Antibiotics are chemical substances produced by microorganisms which can kill or retard the growth of other disease causing microbes even in low concentration.
- Antibiotics are used to treat diseases such as plague, meningitis, diphtheria, syphilis, leprosy, tuberculosis etc.,

(b) Zymology (June23)

- Zymology is an applied science which deals with the biochemical process of fermentation and its practical uses.
- ***Saccharomyces cerevisiae*** generally used to make alcoholic beverages.

(c) Superbug (Aug22)

- "Superbug" is a term used to describe strains of bacteria that are resistant to the majority of antibiotics commonly used today.

11. Write short notes on the following.

a) Brewer's yeast

- ***Saccharomyces cerevisiae*** commonly called brewer's yeast is used for fermenting malted cereals and fruit juices to produce various alcoholic beverages.

b) Ideonella sakaiensis

- ***Ideonella sakaiensis*** is currently tried for recycling of PET plastics.
- These bacteria use PETase and MHETase enzymes to breakdown PET plastic into terephthalic acid and ethylene glycol.

c) Microbial fuel cells (Aug21)

- A Microbial Fuel Cell is a bio-electrochemical system that drives an electric current by using bacteria and mimicking bacterial interaction found in nature Microbial Fuel Cells work by allowing bacteria to oxidize and reduce organic molecules.

Explanation:

- (i) Bacterial respiration is basically one big redox reaction in which electrons are being moved around. A MFC consists of an anode and a cathode separated by a proton exchange membrane.
- (ii) Microbes at the anode oxidize the organic fuel generating protons which pass through the membrane to the cathode and the electrons pass through the anode to the external circuit to generate current.

12. List the advantages of biogas plants in rural areas.

- Biogas is used for cooking and lighting.
- The slurry is drained through another outlet and is used as fertilizer.
- The technology of biogas production was developed by Indian Agricultural Research Institute (IARI) and Khadi and Village Industries Commission (KVIC).

13. When does antibiotic resistance develop? (May22)

- Antibiotic resistance occurs when bacteria develop the ability to defeat the drug designed to kill or inhibit their growth.
- Antibiotic resistance is accelerated by the misuse and over use of antibiotics, as well as poor infection prevention control.
- When the bacteria become resistant, antibiotics cannot fight against them and the bacteria multiply.

14. What is referred to as inductrial alcohol? (Mar24) Briefly explain its preparation. (Mar20)

- Ethanol is referred as industrial alcohol.
- Bacteria such as ***Zymomonas mobilis*** and ***Sarcina ventriculi*** are also involved in ethanol production.
- The principal substrates for the commercial production of industrial alcohol include molasses or corn, potatoes and wood wastes.
- The process of ethanol production starts by milling a feed stock followed by the addition of dilute or fungal amylase (enzyme) from ***Aspergillus*** to break down the starch into fermentable sugars.
- Yeast is then added to convert the sugars to ethanol which is then distilled off to obtain ethanol which is upto 96 percent in concentration.
- Ethanol is often used as a fuel, mainly as a biofuel additive for gasoline.

15. What is bioremediation. (Aug22, June23)

- The use of naturally occurring or genetically engineered microorganisms to reduce or degrade pollutants is called bioremediation. E.g: *Pseudomonas putida*.
- Less expensive and more sustainable.
- ***in situ* bioremediation -** treatment of contaminated soil or water in the site.
- ***ex situ* bioremediation -** treatment of contaminated soil or water is removed from the site and treated.

16. Name some microbes used in the production of household food products. (Sep20)

Name of Microbes	Uses in household food products
LAB bacteria, L. lactis and Streptococcus lactis)	Converts milk into curd
Streptococcus thermophilus, and Lactobasillus bulgaricus	Yogurt
Bacteria Lactococcus Lactobacillus or Streptococcus	Cheeses are made

17. What is single cell protein? Write its uses. (Mar23)

- Single cell protein refers to edible unicellular microorganisms like spirulina.
- Protein extracts from pure or mixed cultures of algae, yeasts, fungi or bacteria may be used as ingredient or as a substitute for protein rich foods and is suitable for human consumption or as animal feed.

LESSON 9 APPLICAIONS OF BIOTECHNOLOGY

1. The first clinical gene therapy was done for the treatment of

a) AIDS b) Cancer c) Cystic fibrosis **d) SCID**

2. Dolly, the sheep was obtained by a technique known as

a) Cloning by gene transfer b) Cloning without the help of gametes

c) Cloning by tissue culture of somatic cells **d) Cloning by nuclear transfer**

3. The genetic defect adenosine deaminase deficiency may be cured permanently by

a) Enzyme replacement therapy

b) Periodic infusion of genetically engineered lymphocytes having ADA cDNA

c) Administering adenosine deaminase activators

d) Introducing bone marrow cells producing ADA into embryo at an early stage of development

4. How many amino acids are arranged in the two chains of Insulin?

a) Chain A has 12 and Chain B has 13 amino acids

b) Chain A has 21 and Chain B has 30 amino acids

c) Chain A has 20 and chain B has 30 amino acids

d) Chain A has 12 and chain B has 20 amino acids.

5. PCR proceeds in three distinct steps governed by temperature, they are in order of (May22)

a) Denaturation, Annealing, Synthesis b) Synthesis, Annealing, Denaturation

c) Annealing, Synthesis, Denaturation d) Denaturation, Synthesis, Annealing

6. Which one of the following statements is true regarding DNA polymerase used in PCR?

a) It is used to ligate introduced DNA in recipient cells b) It serves as a selectable marker

c) It is isolated from a Virus **d) It remains active at a high temperature**

7. ELISA is mainly used for (Mar20, Aug21, Aug22)

a) Detection of mutations **b) Detection of pathogens**

c) Selecting animals having desired traits d) Selecting plants having desired traits

8. Transgenic animals are those which have

a) Foreign DNA in some of their cells **b) Foreign DNA in all their cells**

c) Foreign RNA in some of their cells d) Foreign RNA in all their cells

9. Vaccines that use components of a pathogenic organism rather than the whole organism are called

a) Subunit recombinant vaccines b) attenuated recombinant vaccines

c) DNA vaccines d) conventional vaccines

10. Mention the number of primers required in each cycle of PCR. Write the role of primers and DNA polymerase in PCR. Name the source organism of the DNA polymerase used in PCR.

- Two sets of primers.
- Primers – hybridise to target DNA region.
- DNA polymerase – synthesis DNA region between the primers.
- Source – thermophilic bacterium – thermus aquaticus.

11. How is the amplification of a gene sample of interest carried out using PCR?

- Taq DNA polymerase used in polymerase chain reaction (PCR).
- Steps involved in PCR is 1. Denaturation 2. Renaturation 3. Synthesis.
- During the polymerisation step in PCR, repeated amplification is achieved by the use of Taq DNA polymerase, which remains active even at the high temperature induced denaturation of dsDNA.

12. What is genetically engineered Insulin?

- Genetically engineered insulin called Humulin.
- Bacteria produce insulin which contain human insulin gene in it.
- Generally E.coli bacteria is used for Humulin.

13. Explain how "Rosie" is different from a normal cow.

- First transgenic cow.
- It contains alpha lactalbumin in it.
- It produces protein rich milk (2.4gm / litre).
- It is nutritionally balanced food for new born babies.

14. How was Insulin obtained before the advent of rDNA technology? What were the problems encountered?

- In the early years, insulin isolated and purified from the pancreas of pigs and cows was used to treat diabetic patients.
- This animal insulin results in the occurrence of allergic reactions in some diabetic patients.

15. ELISA is a technique based on the principles of antigen-antibody reactions. Can this technique be used in the molecular diagnosis of a genetic disorder such as Phenylketonuria?

- This technique will not be used to diagnose Phenylketonuria.
- Genetic disorder like sickle cell anemia, β-thalassemia and phenylketonuria can be detected by PCR in these samples.

16. Gene therapy is an attempt to correct a Genetic defect by providing a normal gene into the individual. By this the function can be restored. An alternate method would be to provide gene product known as enzyme replacement therapy, which would also restore the function. Which in your opinion is a better option? Give reasons for your answer.

- Gene therapy is the better option because.
- Enzyme replacement therapy is more costly

17. What are transgenic animals? Give examples.

- Transgenic animals are those animals which contain a foreign gene in their genome, introduced by recombinant DNA technology.
- E.g. Transgenic mice and transgenic rabbit etc.

18. If a person thinks he is infected with HIV, due to unprotected sex, and goes for a blood test. Do you think a test such as ELISA will help? If so why? If not, why?

- ELISA is based on the principle of antigen - antibody interaction.
- ELISA test can be used in diagnose of AIDS.
- HIV Infection by pathogen can be detected by the presence of very small amount of proteins, glycoproteins, or by detecting the antibodies synthesised against the pathogen.

19. Explain how ADA deficiency can be corrected?

- In some children ADA deficiency could be cured by bone marrow transplantation.
- In some patients it can be treated by enzyme replacement therapy.
- It also treated by gene therapy - A healthy and functional human gene is introduced into the lymphocytes using a retrovirus.

20. What are DNA vaccines?

- DNA vaccines are the type of vaccine which contains genetic material.
- A DNA vaccine consists of a gene encoding an antigenic protein, inserted onto a plasmid, and then incorporated into the cells in a target animal.

21. Differentiate between Somatic cell gene therapy and germ line gene therapy. (Aug21, June23)

Somatic cell gene therapy	Germ line cell gene therapy
Therapeutic genes transferred into the somatic cells.	Therapeutic genes transferred into the germ cells.
Introduction of genes into bone marrow cells, blood cells, skin cells etc.,	Genes introduced into eggs and sperms.
Will not be inherited in later generations.	Heritable and passed on to later generations.

22. What are stem cells? Explain its role in the field of medicine. (June23)

- Stem cells are undifferentiated cells found in most of the multi cellular animals.
- Stem cells are capable of self renewal and exhibit 'cellular potency'.

Role:

- Stem cells can differentiate into all types of cells.
- Human stem cells could be used to test new drugs.
- Embryonic stem cells are multipotent stem cells that can differentiate into a number of types of cells.

23. One of the applications of biotechnology is 'gene therapy" to treat a person born with a hereditary disease

i) What does "gene therapy" mean? (May2022)

- It is the replacement of corrective gene in place of defective gene.
- Genetic defect could be corrected by a process.

ii) Name the hereditary disease for which the first clinical gene therapy was used.

- ADA deficiency or SCID (Severe combined immunodeficiency).

iii) Mention the steps involved in gene therapy to treat this disease.

- In some children ADA deficiency could be cured by bone marrow transplantation.
- In some patients it can be treated by enzyme replacement therapy.

24. PCR is a useful tool for early diagnosis of an Infectious disease. Elaborate.

- The specificity and sensitivity of PCR is useful for the diagnosis of inherited disorders (genetic diseases), viral diseases, bacterial diseases, etc.
- Diseases like sickle cell anemia, β-thalassemia and phenylketonuria can be detected by PCR in these samples.
- PCR technique is also used to detect sexlinked disorders in fertilized embryos.

25. What are recombinant vaccines? Explain the types.

- Recombinant DNA technology has been used to produce new generation vaccines.
- The recombinant vaccines are generally of uniform quality and produce less side effects as compared to the vaccines produced by conventional methods.

Types of recombinant vaccines

- Subunit recombinant vaccines: Vaccine that use component of a pathogenic organism rather than whole organism.
- Attenuated recombinant vaccines: Vaccine that contains genetically modified pathogenic organism that are made as non-pathogenic.

- DNA vaccines: Vaccine that contains a gene coding an antigenic protein.

27. Explain why cloning of Dolly, the sheep was such a major scientific breakthrough?

- Dolly was the first mammal clone developed by Ian Wilmut and Campbell in 1997.
- Dolly, the transgenic cow was developed by the nuclear transfer technique and totipotency.
- Dolly was the first animal to be cloned from a differentiated somatic cell taken from an adult animal without the process of fertilization.
- It is a major scientific breakthrough because it Offers benefits for clinical trials and medical research.
- It can help in the production of proteins and drugs in the field of medicine.
- Aids stem cell research.

28. Mention the advantages and disadvantages of cloning.

Advantages:

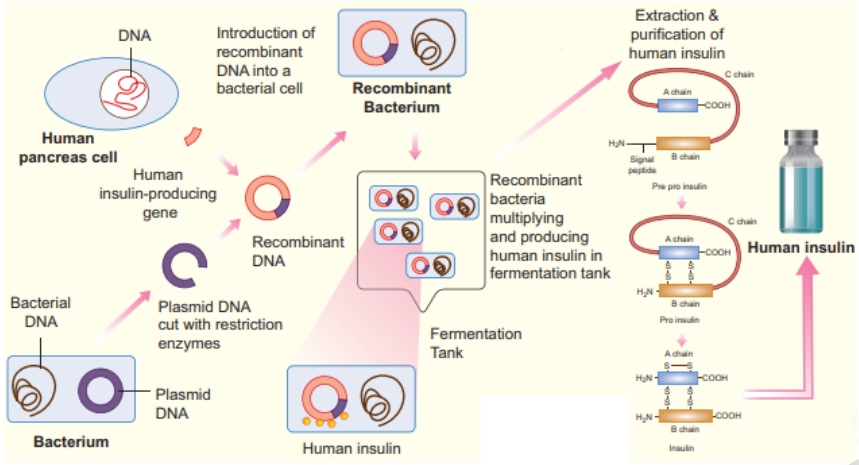
- Animal cloning could help to save endangered species.
- Offers benefits for clinical trials and medical research.
- Aids stem cell research.

Disadvantages:

- It can cause animals to suffer.
- Cloning can lead to occurrence of genetic disorders in animals.
- More than 90% of cloning attempts fail to produce a viable offspring.

29. Explain how recombinant Insulin can be produced.

- Technique involved the insertion of human insulin gene on the plasmids of E.coli.
- The polypeptide chains are synthesized as a precursor called pre-pro insulin, which contains A and B segments linked by a third chain (C) and preceded by a leader sequence.
- The leader sequence is removed after translation and the C chain is excised, leaving the A and B polypeptide chains.
- Insulin was the first ever pharmaceutical product of recombinant DNA technology administered to humans.



ADDITIONAL QUESTIONS:

1. Corona Virus is a RNA virus. Basically PCR technique is used for detecting DNA. If so, how PCR technique is used for diagnosing Corona Virus?

- Corona virus can be detected by Reverse transcription PCR (RT- PCR).

2. Define Oligopotency with example. (Mar24)

- Refers to the stem cells that can differentiate into various types of cells that are related.
- Example blood stem cells can differentiate into lymphocytes, monocytes, neutrophils etc.,

3. yeast is more suitable for production of recombinant interferons than E.coli Give reasons. (Sep20)

- The yeast Sachharomyces cerevisiae is more suitable for production of recombinant interferons than E.coli.
- Since it does not possesses the machinery for glycasylation of proteins.

4. What are adult stem cells. (Mar20) (or) What are the multipotent cells involved in replenishing adult tissue? What is the rich source for it? (Mar23)

- Adult stem cells are found in various tissues of children as well as adults.
- An adult stem cell can divide ad create another cell similar to it.
- Most of the adult stem cells are multipotent.
- It acts as a repair system of the body replenishing adult tissues.
- The red bone marrow is a rich source of adult stem cells.

5. By which event PCR help in RNA Replication? Write in brief about the chemical reaction of that process?

- PCR (RT-PCR) Reverse transcriptase Polymerase chain reaction.
- In this process the RNA molecule (mRNA) is must be converted into complementary DNA (cDNA) by the enzyme reverse transcriptase. The cDNA is then served as a template for PCR.

LESSON 10 ORGANISMS AND POPULATION

1. All populations in a given physical area are defined as (June23)

a) Biome b) Ecosystem c) Territory d) Biotic factors

2. Organisms which can survive a wide range of temperature are called (Aug21)

a) Ectotherms b) Eurytherms c) Endotherms d) Stenotherms

3. The interaction in nature, where one gets benefit on the expense of other is...

a) Predation b) Mutualism c) Amensalism **d) Commensalism**

4. Predation and parasitism are which type of interactions?

a) (+,+) b) (+, O) c) (--, --) **d) (+, --)**

5. Competition between species leads to (Sep20, May22)

a) Extinction b) Mutation c) Amensalism d) Symbiosis

6. Which of the following is an r-species

a) Human **b) Insects** c) Rhinoceros d) Whale

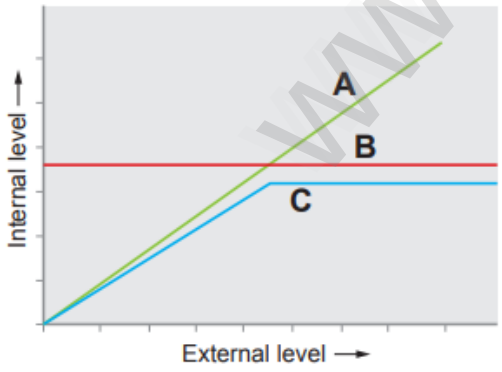
7. Match the following and choose the correct combination from the options given below.

Column I	Column II
A. Mutalism	1. Lion and deer
B. Commensalism	2. Round worm and man
C. Parasitism	3. Birds compete with squirrels for nuts
D. Competition	4. Sea anemone on hermit crab
E. Predation	5. Barnacles attached to Whales

a) A- 4, B-5, C-2, D –3, E-1 b) A- 3, B-1, C-4, D – 2, E-5

c) A- 2, B-3, C-1, D – 5, E-4 d) A- 5, B-4, C-2, D – 3, E-1

8. The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do A, B and C represent respectively



S. No.	A	B	C
a.	**Conformer**	**Regulator**	**Partial Regulator**
b.	Regulator	Partial Regulator	Conformer
c.	Partial Regulator	Regulator	Conformer
d.	Regulator	Conformer	Partial Regulator

Ans: Conformer – Regulator – Partial regulator

9. The relationship between sucker fish and shark is..... (Mar24)

a) Competition **b) Commensalism** c) Predation d) Parasitism

10. Which of the following is correct for r-selected species

a) Large number of progeny with small size b) large number of progeny with large size

c) small number of progeny with small size d) small number of progeny with large size

11. Animals that can move from fresh water to sea called as.....

a) Stenothermal b) Eurythermal **c) Catadromous** d) Anadromous

12. Some organisms are able to maintain homeostasis by physical means ...

a) Conform **b) Regulate** c) Migrate d) Suspend

13. What is a Habitat?

- A habitat can be considered as the 'address' of the organism.
- The collection of all the habitat areas of a species constitutes its geographical range.

14. Define ecological niche.

- Ecological niche which includes the physical space occupied by an organism and its functional role in the community.
- The ecological niche of an organism not only depends on where it lives but also includes the sum total of its environmental requirements.

15. What is Acclimatisation?

- Animals are known to modify their response to environmental changes (stress) in reasonably short time spans. This is known as Acclimatization.

16. What is Pedogenesis? (Aug22)

- A process of formation of soil as regulated by the effect of place, environment, and history.

17. What is soil permeability?

- The characteristic of soil that determines the movement of water through pore spaces is known as soil permeability.

18. Differentiate between Eurytherms and Stenotherms.

Eurytherms	Stenotherms
Organisms which can survive a wide range of temperature are referred to as Eurytherms.	Those organisms which can tolerate only a narrow range of temperature are Stenotherms
Cat, Dog, Tiger, Human	Fish, Frogs, Lizards and Snakes

19. Explain hibernation and aestivation with examples.

- In certain conditions, if the organisms are unable to migrate, it may avoid the stress by becoming inactive. This is seen commonly in bears going into hibernation during winter.
- Some snails and fish go into aestivation to avoid summer related problems like heat and desiccation.

20. Give the diagnostic characters features of a Biome? (Sep20)

Diagnostics features of biome:

- Location, Geographical position (Latitude, Longitude).
- Climate and physiochemical environment.
- Predominant plant and animal life.
- Boundaries between biomes are not always sharply defined.
- Transition or transient zones are seen as in case of grassland and forest biomes.

21. Classify the aquatic biomes of Earth.

- Freshwater (Lakes, ponds, rivers).
- Brackish water (Estuaries / Wetlands).
- Marine (Coral reefs, pelagic zones and abyssal zones)

22. What are the ways by which organisms respond to abiotic factors?

- There are various ways by which organisms respond to abiotic conditions.
- Some organisms can maintain constant physiological and morphological conditions or undertake steps to overcome the environmental condition, which in itself is a response.
- **Regulate:** Some organisms are able to maintain homeostasis by physiologically.
- **Conform:** Most animals cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature.
- **Migrate:** Organisms tend to move away temporarily from a stressful habitat to a new, hospitable area and return when the stressful period is over.
- **Suspend:** In certain conditions, if the organisms is unable to migrate, it may avoid the stress by becoming inactive.

23. Classify the adaptive traits found in organisms.

Structural adaptations:

- The external and internal structures of animals can help them to adapt better to their environment.
- Example mammals growing thicker fur to survive freezing climates.

Behavioural adaptations:

- Action and behaviour of animals are instinctive or learned. Animals develop certain behavioural traits or adaptations for survival.
- Example Hiding during sleep.

Physiological adaptations:

- These are adaptations of organisms that help them to live and survive in their environment with unique niches.
- Example: Lions have sharp canines to hunt and tear meat and a digestive system suitable for digesting raw meat

24. Differentiate Natality and Mortality. (Mar20, May22, Aug22)

- **Natality** is also known as birth rate. Natality is equivalent to birth rate and is an expression of the production of new individuals in the population by birth, hatching, germination (or) fission.
- **Mortality** is also known as death rate. Mortality is the population decline factor and is oppposite to natality. Mortality can be expressed as a loss of individuals in unit time or death rate.

$$\boldsymbol{Natality}\ (\boldsymbol{b}) = \frac{\text{number of birth per unit time}}{\text{Average population}}$$

$$\boldsymbol{Mortality}\ (\boldsymbol{d}) = \frac{\text{number of death per unit time}}{\text{Average population}}$$

25. Differentiate J and S shaped curve. (June23)

J shaped curve	S shaped curve
When a population increases rapidly in an exponential fashion and then stops abruptly due to environmental resistance.	Population of small mammals, increase slowly at first then more rapidly and gradually slow down as environmental resistance increases.
Rapid exponential growth.	Logistic growth.
It is observed in many insects.	Most of the small mammals are example.

26. Give an account of population regulation. (Sep20)

- The inherent tendency of all animal populations is to increase in number. But it does not increase indefinitely.
- Once the carrying capacity of the environment is reached, population numbers remain static or fluctuate depending on environmental conditions.
- This is regulated by many factors which are 1. Density independent – Extrinsic factors 2. Density dependent - Intrinsic factors.
- Extrinsic factors include availability of space, shelter, weather, food, etc.
- Intrinsic factors include competition, predation, emigration, immigration and diseases.

27. Give an account of the properties of soil. (Aug21)

Texture of soil:

- The texture of soil is determined by the size of the soil particles.
- The types of soil include sand, silt and clay on the basis of their size differences.

Porosity:

- The space present between soil particles in a given volume of soil are called pore spaces.

Permeability of soil

- The characteristic of soil that determines the movement of water through pore spaces is known as soil permeability.

Soil Temperature:

- Soil gets its heat energy from solar radiation, decomposing organic matter, and heat from the interior of earth.

Soil water:

- In soil, water is not only important as a solvent and transporting agent, but also maintains soil texture, arrangement and compactness of soil particles, making soil habitable for plants and animals.

28. Differentiate between Tundra and Taiga Biomes.

Tundra Biome	Taiga Biome
This is the almost treeless plain in the northern parts of Asia, Europe and North America.	The Taiga is 1300-1450 km wide zone south of the Tundra.
Precipitation is less than 250 mm per year.	Precipitation ranges about 380-1000 mm per year
Winters are long, Summers are short.	Summer temperature ranges from 10^{0} C to 21^{0} C.
Dwarf willows, birches, mosses, grasses,	The Taiga is a forest of coniferous trees such as

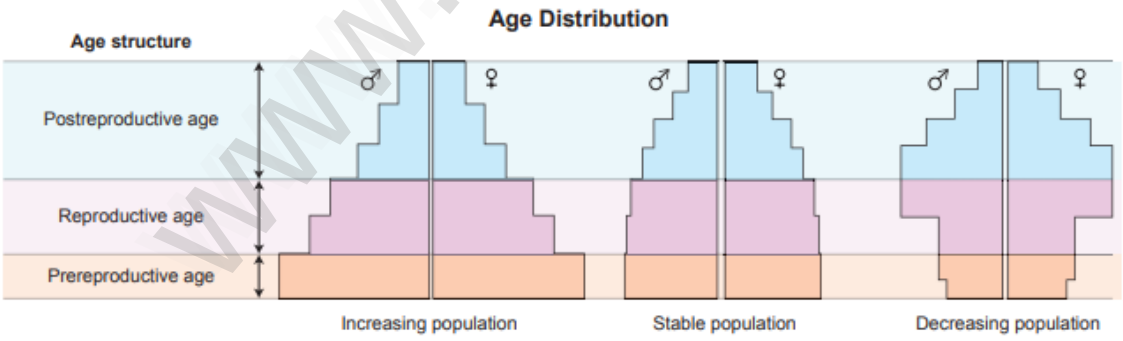
sedges are the flora here.	spruce, fir and pine.
Because of the severe winters, many of the animals are migratory. For example, ducks, geese, nest in the Tundra during the summer and migrate south for the winter.	Important migratory herbivores include moose, elk, deer and reindeer.

29. List the adaptations seen in terrestrial animals.

- Earthworms, land Planarians secrete a mucus coating to maintain a moist situation for burrowing, coiling, respiration, etc.,
- Arthropods have an external covering over the respiratory surfaces and well developed tracheal systems.
- In vertebrate skin, there are many cellular layers besides the well protected respiratory surfaces that help in preventing loss of water.
- Some animals obtain their water requirement from food as partial replacement of water lost through excretion.
- Birds make nests and breed before the rainy season as there is availability of abundant food. But during drought birds rarely reproduce.

30. Describe Population Age Distribution.

- The proportion of the age groups (pre- reproductive, reproductive and post reproductive) in a population is its age distribution attribute.
- This determines the reproductive status of the population at the given time and is an indicator of the future population size.

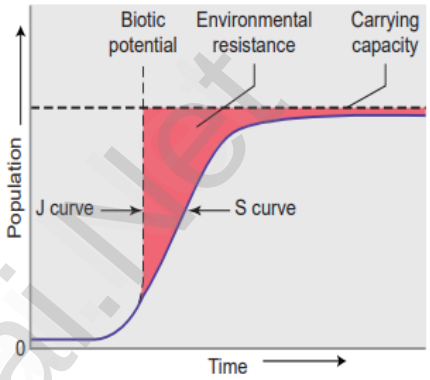


31. Describe Growth Models/Curves. (Sep20)

- Populations show characteristic growth patterns or forms.
- These patterns can be plotted and termed as J-shaped growth form and S-shaped growth form (Sigmoid form).

J shaped growth curve:

- When a population increases rapidly in an exponential fashion and then stops abruptly due to environmental resistance.
- Rapid exponential growth.
- It is observed in many insects.



S Shaped growth curve:

- Population of small mammals, increase slowly at first then more rapidly and gradually slow down as environmental resistance increases.
- Logistic growth.
- Most of the small mammals are example.

32. Tabulate and analysis of two species population interaction.

S.no	Type of interaction	Species 1	Species 2	General natue of interaction	Example
1	Amensalism	**-**	**0**	The most powerful animal or large organisms inhibits the growth of other lower organisms	Cat and Rat
2	Mutualism	**+**	**+**	Interaction favorable to both and obligatory	Between crocodile and bird

ADDITIONAL QUESTONS:

1. Differentiate between predator and prey.

Predator	Prey
It is an animal that hunts kills and eats other animals for food.	It is an organism that predators kill for food.

2. What is stenotherms?

- Organisms which can tolerate only a narrow range of temperature are Stenotherms
- E.g: Fish, Frogs, Lizards and Snakes.

3. Define Bergmann's rule

- Birds and mammals attain greater body size in colder regions than warmer regions.

4. What is population density. (MAR-2020)

- It refers to its size in relation to unit of space and time. The size of population can be measured as the number of individuals per unit area or volume. eg: 100 trees per acre.

5. What is pedogenesis? Mention any two of its functions. (Aug-2022)

- Soil is formed from rocks which are the parent materials of soil, by weathering and is called embryonic soil (Pedogenesis).

Functions:

i) Medium for plant growth.

ii) Means for water storage and purification

iii) Modifier of earth's atmosphere

6. Define Allen's rule

- Warm blooded animals, living in colder climates, tend to have shorter limbs, ears and other appendages when compared to the members of the same species in warmer climates.

7. Define Jordon's rule

- In some aquatic environments, an inverse relationship between water temperature and fish meristic characters is observed -lower the temperature, more the vertebrae.

8. Briefly explain Van't Hoff's rule.

- Van't Hoff proposed that, with the increase of every 10°C, the rate metabolic activity doubles or the reaction rate is halved with the decrease of 10°C. This rule is referrred as the Van't Hoff's rule.

9. Write a various difference between r-selected and k-selected species.

r-related species	k-selected species
Smaller sized organisms	Larger sized organisms
Produce may offspring	Produce few offspring
Mature early	Late maternity
Short life expectancy	Long life expectancy
Each individual reproduces only once or few times in their lifetime	Can reproduce more than once in lifetime

LESSON 11 BIODIVERSITY AND ITS CONSERVATION

1. Which of the following region has maximum biodiversity

a) Taiga **b) Tropical forest** c) Temperate rain forest d) Mangroves

2. Conservation of biodiversity within their natural habitat is

a) Insitu conservation b) Exsitu conservation

c) In vivo conservation d) In vitro conservation

3. Which one of the following is not coming under insitu conservation

a) Sanctuaries b) Natural parks **c) Zoological park** d) Biosphere reserve

4. Which of the following is considered a hotspots of biodiversity in India

a) Western ghats b) Indo-gangetic plain c) Eastern Himalayas **d) A and C**

5. The organization which published the red list of species is

a) WWF **b) IUCN** c) ZSI d) UNEP

6. Who introduced the term biodiversity? (Aug22)

a) Edward Wilson **b) Walter Rosen** c) Norman Myers d) Alice Norman

7. Which of the following forests is known as the lungs of the planet earth?

a) Tundra forest b) Rain forest of north east India c) Taiga forest **d) Amazon rain forest**

8. Which one of the following are at high risk extinction due to habitat destruction (Mar20,22,23)

a) Mammals b) Birds **c) Amphibians** d) Echinoderms

9. Assertion: The Environmental conditions of the tropics are favourable for speciation and diversity of organisms.

Reason: The climate seasons, temperature, humidity and photoperiod are more or less stable and congenial.

a) Both Assertion and Reason are true and Reason explains Assertion correctly.

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

c) Assertion is true , but Reason is false. d) Both Assertion and Reason are false.

10.(a) Species rich

- The number of species per unit area at a specific time is called species richness.

(b)Define endemism. (Sep2020)

- The phenomenon in which the organisms are exclusively restricted to a given area. Eg: wild ass is endemic to Indian desert.

11. How many hotspots are there in India? Name them.

- India has four biodiversity hotspots
- Himalaya, Western Ghats, Indo-Burma, Sundalands.

12. What are the three levels of biodiversity?

- Genetic diversity
- Species diversity
- Community or Ecosystem diversity.

13. Name the active chemical found in the medicinal plant *Rauwolfia vomitoria*. What type of diversity it belongs to?

- Reserpine is the active chemical found *Rauwolfia vomitoria*.
- It belongs to genetic diversity.

14. "Amazon forest is considered to be the lungs of the planet"-Justify this statement. (June23)

- Amazon forest is considered to be the lungs of the planet because it has numerous plants which involve in reduction of CO_2 by photosynthesis, hence it is called as "Lungs of the planet"

15. 'Red data book'-What do you know about it? (June23)

- Red Data book or Red list is a catalogue of taxa facing risk of extinction.
- Red Data book is maintained by WCU and IUCN.
- It was suggested in 1963.

The purpose of preparation of Red List are:

- To create awareness on the degree of threat to biodiversity.
- Identification and documentation of species at high risk of extinction.
- Provide global index on declining bio diversity.
- Red list has eight categories of species

i) Extinct ii) Extinct in wild iii) Critically Endangered
iv) Endangered v) Vulnerable vi) Lower risk
vii) Data deficiency viii) Not evaluated.

16. Compare and Contrast the insitu and exsitu conservation. (Mar23)

In situ Conservation	Ex situ Conservation
It is the on-site conservation of plant or animal species.	It is a conservation of threatened animals and plants in special care locations for their protection.
It is the process of protecting an endangered plant or animal species in its natural habitat	It helps in recovering populations or preventing their extinction under simulated conditions that closely resemble their natural habitats.
National Parks, Biosphere Reserve, Wild Life Sanctuaries	Zoological parks and Botanical gardens.

17. What are called endangered species? Explain with examples. (Sep20)

- A species that has been categorized as very likely to become extinct is an endangered species. E.g : Dodo bird, orchid bees, Sparrow, White tiger.
- It is categorized by the International Union for Conservation of Nature (IUCN).
- In 1998 there were1102 animal and 1197 plant species in the IUCN Red List.
- In 2012, the list features 3079 animal and 2655 plant species as endangered (EN) worldwide.

18. Why do we find a decrease in biodiversity distribution, if we move from the tropics towards the poles?

- Harsh conditions exist in temperate areas during the cold seasons while very harsh conditions prevail for most of the year in polar regions.
- The temperatures vary between 25ºC to 35ºC.
- Decrease in species diversity occurs as one ascends a high mountain due to drop in temperature (temperature decreases @ 6.5º C per Km above mean sea level).

19. What are the factors that drive habitat loss?

- Mining
- Construction of highways
- Over population
- Urbanization, industrialization
- Agricultural advancements
- Filling wetlands
- Ploughing grasslands
- Cutting down trees
- Deforestation
- Caving mountains

20. Alien species invasion is a threat to endemic species – substantiate this statement.

- Alien species are exotic species (non-native).
- They often become invasive and drive away the local species.
- Exotic species have proved harmful to both aquatic and terrestrial ecosystems. E.g: Tilapia fish (Jilabi kendai) (Oreochromis mosambicus).

21. Mention the major threats to biodiversity caused by human activities. Explain.

- Fragmentation and degradation due to agricultural practices, extraction (mining, fishing, logging, harvesting).
- Development (settlements, industrial and associated infrastructures) leads to habitat loss.
- Some of the other threats include specialised diet, specialized habitat requirement, large size, small population size, limited geographic distribution and high economic or commercial value.
- Individual home range of Lion can be about 100 square Km.

22. What is mass extinction? Will you encounter one such extinction in the near future. Enumerate the steps to be taken to prevent it.

- The extinction of large number of species within a short period of time is known as mass extinction.
- A mass extinction occurred about 225 million years ago during the Permian, where 90% of shallow water marine invertebrates disappeared.
- The extinction of species is mainly due to drastic environmental changes and population characteristics.

Preventation:

- Wildlife Protection Act should be implemented.
- Identify and protect all threatened species.
- Air, water and soil should be conserved on priority basis

23. In north eastern states, the jhum culture is a major threat to biodiversity – substantiate.

- When vast areas are cleared and burnt, it results in loss of forest cover, pollution and discharge of CO_2 which in turn attributes to loss of habitat and climate change which has an impact on the faunal diversity of that regions.

24. List out the various causes for biodiversity losses. (Aug21, Mar23)

Direct human activities:

- Change in local land use,
- Species introduction or removal,
- Harvesting,
- Pollution and
- Climate change.

Indirect human activities:

- Demographic,
- Economic,
- Technological,
- Cultural and religious factors.

25. How can we contribute to promote biodiversity conservation?

- Identify and protect all threatened species.
- Identify and conserve in protected areas the wild relatives of all the economically important organisms.
- Identify and protect critical habitats for feeding, breeding, nursing, resting of each species.
- Resting, feeding and breeding places of the organisms should be identified and protected.
- Air, water and soil should be conserved on priority basis.
- Wildlife Protection Act should be implemented.

26. Write a note on i) Protected areas, ii) Wild life sanctuaries, iii) WWF

i) Protected areas

- These are bio geographical areas where biological diversity along with natural and cultural resources is protected, maintained and managed through legal measures.
- Protected areas include national parks, wild life sanctuaries, community reserves and biosphere reserves.
- India has about 771 protected areas covering 162099 km2 comprising of National Parks (104), Wild Life Sanctuaries (544), biosphere reserves (18) and several sacred groves.

ii) Wild life sanctuaries

- Sanctuaries are tracts of land where wild animals and fauna can take refuge without being hunted or poached.
- Periyar wild life sanctuary in Kerala is famous for the Indian Tiger and Asiatic Elephant.
- There are 544 existing wildlife sanctuaries in India covering an area of 118,918 km^2 , which is 3.62 % of the geographical area of the country (National Wildlife Database, 2017).
- **WWF – World Wide Fund for Nature**, is an international non government organization found in 1961.
- It works on the field of wilderness preservation and the reduction of human impact on the environment.

ADDITIONAL QUESTIONS:

1. What is Co Extinction? Give an example. (Aug21)

- Coextinction of a species is the loss of a species as a consequence of the extinction of another. (E.g: orchid bees and forest trees by cross pollination).

2. Write about gene banks?

- Gene banks are a type of biorepository which preserve genetic materials
- Gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques.

3. In many parts of Chennai, number of dove increases rather than crow. What type of habitat loss it is? Define. (Sep20)

- It is urbanization type of habitat loss.
- Number of pigeons increases because it can easily adapt the situation of urban.
- Crow is an omnivore and lived in a nest. They need trees for shelter.

LESSON 12 ENVIRONMENTAL ISSUES

1. Right to Clean Water is a fundamental right, under the Indian Constitution

a) Article 12 **b) Article 21** c) Article 31 d) Article 41

2. The 'thickness' of Stratospheric Ozone layer is measured in/on:

a) Sieverts units **b) Dobson units** c) Melson units d)Beaufort Scale

3. As per 2017 statistics, the highest per capita emitter of Carbon dioxide in the world is

a) USA **b) China** c) Qatar d) Saudi Arabia

4. The use of microorganism metabolism to remove pollutants such as oil spills in the water bodies is known as

a) Biomagnification **b) Bioremediation** c) Biomethanation d) Bioreduction

5. Which among the following always decreases in a Food chain across tropic levels?

a) Number b b)Accumulated chemicals **c) Energy** d) Force

6. In the E-waste generated by the Mobile Phones, which among the following metal is most abundant?

a) Copper b) Silver c) Palladium d) Gold

7. _____ is/are an ideal disinfectant for waste water. (June23)

a) U-V Rays b) Chlorination c) Boiling d) Ozonisation

8. SMOG is derived from:

a) Smoke b) Fog **c) Both A and B** d) Only A

9. Excess of fluoride in drinking water causes:

a) Lung disease b) Intestinal infection **c) Fluorosis** d) None of the above

10. Expand (i) CFC (ii) AQI (iii) PAN (Mar23)

- CFC – ChloroFluroCarbon.
- AQI – Air Quality Index.
- PAN – Peroxy Acetyl Nitrate.

11. What is SMOG and how it is harmful for us?

- Smog is a type of air pollution caused by tiny particles in the air.
- SMOG = Smoke + Fog.
- Smog can make breathing more difficult, especially for people with asthma.

12. List all the wastes that you generate, at home, school or during your trips to other places. Could you very easily reduce the generation of these wastes? Which would be difficult or rather impossible to reduce?

Waste category	Sources
Residential	Food wastes, plastics, paper, glass, leather, metal, batteries, tires, mattress, etc.
School	Wood, paper, metal, cardboard, materials, electronics, glass, etc.
During trip	Plastic water bottle, carry bag, aluminium foil, etc.

- Yes, we can reduce the generation of waste by adopting some measure.
- Plastics and E-waste are very difficult to remove because they are non – bio degradable.

13. Write notes on the following: a. Eutrophication b. Algal Bloom

- **Eutrophication** - Excessive richness of nutrients in a lake or other water bodies frequently due to run of fertilizers from the land causing dense growth of plant life.
- **Algal bloom** - Presence of large amounts of nutrients in waste water causing excessive growth of planktonic algae.

14. What effect can fertilizer runoff have on an aquatic ecosystem?

- Overflow of nutrient rich water from land to water bodies like lakes, it results in dense growth of plant life.
- It will result in Eutrophication and algal bloom.

15. How can we control eutrophication?

- Eutrophication can be controlled by reducing the use of fertilizers in agricultural lands, checking the runoff from fields, planting vegetations along stream beds thereby the nutrients will be up taken by plants.

16. Discuss the role of an individual to reduce environmental pollution.

- Decrease waste generation.
- Use efficient transportation.
- Reduce energy consumption.
- Planting trees.
- Using reusable plastics.
- Create awareness and Education.

17. How does recycling help reduce pollution?

- Recycling prevents the emission of many greenhouse gases which are the major cause for global warming.
- It also reduces the water pollutants and save energy.

18. Discuss briefly the following :

a. Catalytic converter

- Catalytic converters in vehicles help to reduce polluting gases drastically.

b. Ecosan.

- Ecological sanitation (EcoSan) is a sustainable system for handling human excreta by using dry composting toilets.
- EcoSan toilets not only reduce wastewater generation but also generate the natural fertilizer from recycled human excreta, which forms an excellent substitute for chemical fertilizers.

19. What are some solutions to toxic dumping in our oceans?

- Pseudomonas putida is a multi-plasmid hydrocarbon degrading bacterium which can digest the hydrocarbons in the oil spills.
- Management and minimization of waste dumping at the port.
- Education and awareness creation.
- Regulations and laws.
- Using reusable plastics

20. Define BOD.

- BOD refers to the amount of the oxygen that would be consumed, if all the organic matter in one litre of water were oxidized by bacteria.

21. What is referred to as biomagnification? (Aug21)

- When non degradable substances enter the food chain they are not broken down.
- They are transferred from one tropic level to another in food chain.
- There is a increase in concentration of that toxic substances.

22. What are the effects of noise pollution?

- There is increase of blood pressure.
- There is increased stress, tension, nervousness, anxiety and depression.
- Peptic ulcer, severe headache and memory loss.
- Marine animals are affected by noise pollution.
- Fire crackers frighten animals and birds.

ADDITIONAL QUESTIONS:

1. What is meant by Sameer? (Mar24)

- Sameer, an App provides hourly updates on the National Air Quality Index (AQI) published by CPCB.

2. Recently e waste and plastic waste have created dangerous effects in the environment, in order to protect the environment what will be the solution? (Mar24).

- Solution - Recycle or reuse or resale or salvage.
- Great care must be taken to avoid unsafe exposure in recycling operations in leaking of materials of minerals such as heavy metals from landfills and incinerator ashes.

3. What is the effect of water pollution on organisms? (Sep20)

- It increases biological O2 demand leads to the death of organisms.
- It also clogs fish gills and feathers of aquatic birds.
- Excess of fluoride cause fluorosis.
- Occurrence of epidemic water borne diseases.

4. What are pollutants? Classify them. (Aug22)

- Pollutants include the abundant presence of solid, liquid or gaseous substances produced by human or natural activity.

Classification of pollutants:

- Rapidly degradable pollutants.
- Slowly degradable pollutants.
- Non degradable pollutants.

5. What are called medical wastes? Write a note on it management and the methods of disposal? (Aug22)

- Any kind of waste that contains infectious material generated by hospitals, laboratories, medical research centers, Pharmaceutical companies and Veterinary clinics are called medical wastes.
- Management: The safe and sustainable management of biomedical waste is the social and legal responsibilities of people working in healthcare centers.

6. Give an account of control and management of radio active wastes. (May22).

- Limit generation - It is the first and most important consideration in managing radioactive wastes.
- Dilute and disperse - For wastes having low radioactivity, dilution and dispersion are adopted.
- Delay and decay - It is frequently an important strategy because much of the radioactivity in nuclear reactors and accelerators is very short lived.
- Concentrate and confine process Concentrating and containing is
- the objective of treatment activities for longer lived radioactivity. The waste is contained in corrosion resistant containers and transported to disposal sites. Leaching of heavy metals and radionuclides from these sites is a problem of growing concern.

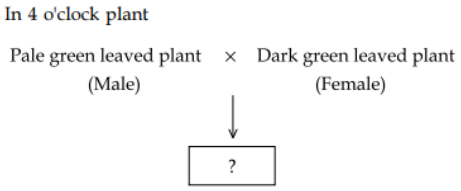
PUBLIC EXAM QUESTIONS MARCH 2020 (BIO BOTANY)

2 MARKS

9. Define Cybrid.
10. Write any four uses of Seedball.
11. What are the objectives of clean development mechanism ?
12. Define - Organic farming.
13. Write the Botanical name and family of Nilavembu. Write any one of its uses.
14. Name the enzymes involved in genetic engineering.

3 MARKS

15.



16. What is pBR 322 plasmid ?
17. What is Green House Effect ? Draw the relative contributions of green house gases.
18. Give an account on cryo preservation.
19. Write the three differences between Habitat and Niche.

5 MARKS

20(a) Explain the different mode of entry of pollen tube into the ovule.

(OR)

(b) What is gene mapping and write its uses.

21. (a) How to protect the ecosystem ?

(OR)

(b) Ramu and Somu are farmers. Ramu cultivated the crops by self fertilization method. Somu cultivated the crops from mixed population.
(i) Who will get new variety ?
(ii) Write the advantages and disadvantages of their selection.

PUBLIC EXAM QUESTIONS MARCH 2020 (BIO ZOOLOGY)

2 MARKS

9. What is Ovulation ? In which day of menstrual cycle it takes place ?
10. Write the cause of Down's Syndrome.
11. What are Operons ? How many operon groups are present in E.coli ?
12. Write any two differences between active and passive Immunity.
13. Which is referred to as Industrial alcohol ? Why?
14. What is the most important application of human stem cells?

3 MARKS

15. What is known as "Let-Down" reflex ?
16. Write a note on "Amniocentesis".
17. Name the hormone secreted by Thymus gland and mention two functions of that hormone.
18. Write about gene banks.
19. A character present in grandfather goes to grandson through daughter. Draw flowchart for this pattern of Inheritance.

5 MARKS

20. (a) Write about the methodologies of HGP.

(OR)

(b) Explain the evolutionary path of Man.

21. (a) Write short notes on :
(i) Population Density
(ii) Natality and Mortality

(OR)

(b) Write about the effects of chemicals used in the field of Agriculture.

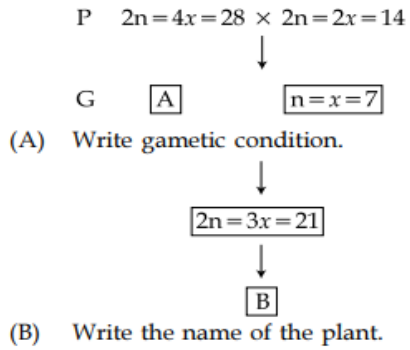
PUBLIC EXAM QUESTIONS SEPTEMBER 2020 (BIO BOTANY)

2 MARKS

9. Draw and mark the parts of first cell of male gametophyte.
10. Write short notes on Sonara 64.
11. What are embryoids ?
12. What is Leaching?
13. Define Heterosis.
14. What will happen when Rhizobium bacteria is applied to the soil ?

3 MARKS

15. Write any three practical applications of polyembryony.
16.



17. How are artificial seeds produced ?
18. Write the uses of silvopasture system.
19. Differentiate Autotrophic components from Heterotrophic components.

5 MARKS

20(a) Explain Intergenic Interaction with an example.

(OR)

(b) List out any five applications of Biotechnology.

21. (a) Water is essential for life. State the reason. Write any four features for plants which enable them to survive in water scarcity environment.

(OR)

(b) (i) Write the botanical name of State Tree of Tamil Nadu.
(ii) From where it is originated ?
(iii) Write its three uses.

PUBLIC EXAM QUESTIONS SEPTEMBER 2020 (BIO ZOOLOGY)

2 MARKS

9. Draw and label the parts of human sperm cell.
10. Define – Transcription.
11. What are vestigial organs ? Give an example.
12. Name some microbes used in the production of household food products.
13. Define – Endemism.
14. In many parts of Chennai, number of dove increases rather than crow. What type of habitat loss it is ? Define.

3 MARKS

15. What is Ectopic Pregnancy ? Write its consequence.
16. What is meant by Surrogacy ?
17. Write the Lamark's theory of Inheritance of acquired characters.
18. Yeast is more suitable for production of recombinant interferons than E. Coli. Give reasons.
19. List out intrinsic factors and extrinsic factors in population regulation.

5 MARKS

20. (a) What are Multiple Alleles ? Describe their inheritance in Human with example.

(OR)

(b) The relationship between genes and DNA are best understood by mutation studies. Justify this statement.

21. (a) If immunological surveillance is effective, cancer should not occur. Justify.

(OR)

(b) We are polluting water resources. What will be the consequences of water pollution on organisms ?

PUBLIC EXAM QUESTIONS SEPTEMBER 2021 (BIO BOTANY)

2 MARKS

9. Define multiple alleles.
10. Name the chemicals used in gene transfer.
11. What is Co-evolution ?
12. Pyramid of energy is always upright. Give reasons.
13. Differentiate primary introduction from secondary introduction.
14. Name the humors that are responsible for the health of human beings.

3 MARKS

15. Mention the name of man-made cereal. How it is formed ?
16. What are the materials used to grow microorganism like Spirulina ?
17. Differentiate cladode from phyllode with example.
18. Give four examples of plants cultivated in commercial agroforestry.
19. Draw the diagrammatic structure of ovule and label its parts.

5 MARKS

20 (a) Discuss the steps involved in Microsporogenesis.

(OR)

(b) Describe dominant epistasis with an example.

21. (a) Explain the basic concepts involved in plant tissue culture.

(OR)

(b) Explain the types of succession.

PUBLIC EXAM QUESTIONS SEPTEMBER 2021 (BIO ZOOLOGY)

2 MARKS

9. What is parthenogenesis ?
10. What is amniocentesis ?
11. Write the central dogma of protein synthesis.
12. What is vaccine ?
13. What is Co-extinction ?
14. What is referred to as bio-magnification ?

3 MARKS

15. Write the salient features of mutation theory.
16. Write short notes on microbial fuel cell.
17. Differentiate somatic cell gene therapy from germ line gene therapy.
18. List out any five causes of biodiversity loss.
19. If a marriage occurs between normal man ($X^H Y^-$) and heterozygous haemophiliac woman ($X^H X^h$), what would be the result of F_1 and F_2 ? Draw flow chart.

5 MARKS

20. (a) Explain the process of fertilization and prevention of polyspermy in human.

(OR)

(b) Explain the classical model of Lac Operon, proposed by Jacob and Monod

21. (a) Explain the structure of immunoglobulin with suitable diagram.

(OR)

(b) Give an account of the properties of soil.

PUBLIC EXAM QUESTIONS
MAY 2022 (BIO BOTANY)
2 MARKS

9. What is Mellitophily ?
10. What are the enzymes you can use to cut terminal end and internal phosphodiester bond of nucleotide sequence ?
11. What is myrmecophily ?
12. Draw a pyramid from following details and name the type of pyramid. Quantities of organisms are given Hawks-50, Plants-1000, Rabbit and Mouse 250+250. Pythons and Lizard 100+50 respectively.
13. How are microbial inoculants used to increase the soil fertility ?
14. Give definitions for organic farming.

3 MARKS

15. List out the functions of tapetum.
16. What is the difference between missense and nonsense mutation ?
17. What do you know about the word pBR 322 ?
18. What is CCS ?
19. Distinguish habitat and niche.

5 MARKS

20(a) Give a detailed account on parthenocarpy, add a note on its significance.

(OR)

(b) Differentiate incomplete dominance and co-dominance.

21. (a) Write the applications of plant tissue culture.

(OR)

(b) What are the King and Queen of spices ? Write their uses.

PUBLIC EXAM QUESTIONS
MAY 2022 (BIO ZOOLOGY)
2 MARKS

9. What is parthenogenesis ? Give example.
10. What is surrogacy ?
11. Differentiate template strand from coding strand.
12. Who disproved Lamarck's theory of acquired characters ? How ?
13. Write the symptoms of filariasis.
14. What does gene therapy mean ?

3 MARKS

15. Differentiate foeticide from infanticide.
16. Autoimmune disease is a misdirected immunity response. Justify.
17. When does antibiotic resistance develop ?
18. Differentiate Natality from Mortality.
19. In the XY chromosomal system of sex determination, males have only one 'X' chromosome, whereas females have two. How does the organism compensate for this dosage differences between the sexes ?

5 MARKS

20. (a) Explain the structure of Human Ovum with a neat labelled diagram.

(OR)

(b) Write the salient features of Human Genome Project.

21. (a) Explain the structure of immunoglobulin with suitable diagram.

(OR)

(b) Write an essay on radioactive waste management.

PUBLIC EXAM QUESTIONS
JULY 2022 (BIO BOTANY)
2 MARKS

9. Give the types of Synapsis.
10. What is C- value.
11. Differentiate Biotope and Epitope.
12. What is PAR?
13. What is SLF?
14. What is Bio-pest repellent?

3 MARKS

15. Draw and explain Hemianatropous ovule with an example.
16. Give the significance of ploidy.
17. What is bio-remediation?
18. Draw and explain the thermal stratification of a pond.
19. What is green house effect? What are the genes involved in it?

5 MARKS

20(a) Give the character of Anemophilous plants.

(OR)

(b) Explain the incomplete dominance with example.

21. (a) Explain the food web with an example. Give its significance.

(OR)

(b) What are artificial seeds? Give the advantages of artificial seeds.

PUBLIC EXAM QUESTIONS
JULY 2022 (BIO ZOOLOGY)
2 MARKS

9. Define – Gametogenesis.
10. Differentiate foeticide and infanticide.
11. What is a genetic code?
12. Define the term superbug.
13. Differentiate between somatic cell and germ line cell gene therapy.
14. Differentiate Natality and Mortality.

3 MARKS

15. Draw a neat labeled diagram of human sperm.
16. What is Bio remediation? Name any one microorganism involved in bioremediation.
17. What is pedogenesis? Mention any two of its function?
18. State the theory of Spontaneous generation.
19. Classify the pollutants.

5 MARKS

20. (a) What is Karyotyping? Write the applications of karyotyping?

(OR)

(b) What are called medical wastes? Write a note on its management and the methods of disposal.

21. Write the goals of Human Genome project (HGP).

(OR)

(b) What is vaccine? Explain its types.

PUBLIC EXAM QUESTIONS MARCH 2023 (BIO BOTANY)

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9. Give the types of Synapsis.
10. What is C- value.
11. Differentiate Biotope and Epitope.
12. What is PAR?
13. What is SLF?
14. What is Bio-pest repellent?

3 MARKS

15. Draw and explain Hemianatropous ovule with an example.
16. Give the significance of ploidy.
17. What is bio-remediation?
18. Draw and explain the thermal stratification of a pond.
19. What is green house effect? What are the genes involved in it?

5 MARKS

20(a) Give the character of Anemophilous plants.

(OR)

(b) Explain the incomplete dominance with example.

21. (a) Explain the food web with an example. Give its significance.

(OR)

(b) What are artificial seeds? Give the advantages of artificial seeds.

PUBLIC EXAM QUESTIONS MARCH 2023 (BIO ZOOLOGY)

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11. What is a genetic code?
12. Define the term superbug.
13. Differentiate between somatic cell and germ line cell gene therapy.
14. Differentiate Natality and Mortality.

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15. Draw a neat labeled diagram of human sperm.
16. What is Bio remediation? Name any one microorganism involved in bioremediation.
17. What is pedogenesis? Mention any two of its function?
18. State the theory of Spontaneous generation.
19. Classify the pollutants.

5 MARKS

20. (a) What is Karyotyping? Write the applications of karyotyping?

(OR)

(b) What are called medical wastes? Write a note on its management and the methods of disposal.

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Prepared By

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