MODEL PAPER – 4

Time : 3 Hours + 15 Minutes] **[Total Marks : 70**

Instructions to the Candidates :

1. Candidates are required to give their answers in their own words as far as practicable.
2. Figures in the right hand margin indicate full marks.
3. 15 minutes of extra time has been allotted for the candidate to read the questions carefully.
4. This question paper is divided into two sections : **Section–A** and **Section–B**.
5. In **Section–A**, there are **70 Objective Type Questions**, out of which only 35 objective questions be answers. Darken the circle with blue/black ball pen against the correct option on OMR Sheet provided to you. Do not use **Whitener/Liquid/Blade/Nail** on OMR Paper, otherwise the result will be invalid.
6. In **Section–B**, there are **20 Short Answer Type Questions** (each carrying 2 marks), out of which any 10 questions are to be answered. Apart from this, there are **6 Long Answer Type Questions** (Each carrying 5 Marks), our of which any 3 of them are to be answered.
7. Use of any electronic device is prohibited.

SECTION – A : Objective Type Questions

Directions : *There are 70 Objective Type Questions, out of which only 35 objective questions to be answered. For each question, mark the correct option on the answer sheet.*

$35 \times 1 = 35$

1. Which type of binary fission occures in Paramecium ?
   (A) Simple binary fission
   (B) Transverse binary fission
   (C) Longitudinal binary fission
   (D) Oblique binary fission
2. Hemochorial placenta is found in which of the following ?
   (A) Cat (B) Dog
   (C) Humans (D) Horse
3. What is dihybride test cross ration ?
   (A) 1 : 1 (B) 7 : 1 : 1 : 7
   (C) 1 : 1 : 1 : 1 (D) 1 : 7 : 7 : 7
4. Nuclear transplantation technique was discovered by :
   (A) Griffith (B) Gurdon
   (C) Briggs (D) Ian Wilmut
5. First mammal appeared in which period of era ?
   (A) Permian (B) Triassic
   (C) Tertiary (D) None of these
6. Food poisoning is caused by :
   (A) Rhizobium (B) Azotobacter
   (C) Lactobacillus (D) Clostridium
7. Restriction enzymes Eco RI cleaves DNA at which sequence ?
   (A) –GTATATC– (B) –AAGCTT–
   (C) –AAGTTC– (D) –GAATTC–
8. A tumour inducing plasmid widely used in the production of transgenic plants is that of :
   (A) Bacillus thuringiensis
   (B) Agrobacterium tumefaciens
   (C) Staphylococcus aureus
   (D) E.coli
9. Lichen is pioneer in succession of :
   (A) Hydrosere (B) Lithosere
   (C) Xerosere (D) Both (B) and (C)
10. Which one in the following is a systematic insecticide ?
    (A) Endrin (B) Furadan
    (C) Malathion (D) Parathion
11. External fertilization is found is :
    (A) Reptiles (B) Birds
    (C) Earthworm (D) Frog
12. What is the ploidy level of chromosomes in endosperm of angiospermic plant?
    (A) n (B) $2n$
    (C) $3n$ (D) Both 'A' and 'C'
13. How many meiotic cell division are required to produce 124 spermatozoa ?
    (A) 124 (B) 31
    (C) 30 (D) 62
14. Fertilization outside the body is called :
    (A) In vitro (B) In vivo
    (C) 'A' and 'B' both (D) None
15. Anemophily type of pollination is not found in :
    (A) Grass (B) Maize
    (C) Wheat (D) Salvia
16. Anemophily takes place (pollination) by :
    (A) By Bird (B) By Bat
    (C) By Snail (D) By Wind
17. Anemophilous flowers are usually :
    (A) attractive (B) small
    (C) colourless (D) both 'B' and 'C'
18. Gynoecium is made up of :
    (A) Stigma (B) Style
    (C) Ovary (D) All of these
19. Which one of the following is unisexual ?
    (A) Mustard (B) China rose
    (C) Papaya (D) none of these

20. Ovule develops into :
(A) Fruit (B) Flower
(C) Seed (D) Cotyledon

21. What is fertilisation ?
(A) Fusion of egg with male nucleus
(B) Fusion of egg with secondary nucleus
(C) Fusion of egg with synergid
(D) None of these

22. Uterus is related to :
(A) Male Reproductive system
(B) Female Reproductive system
(C) Plant Reproductive system
(D) All of these

23. Copper T/loop prevents :
(A) Ovulation (B) Fertilization
(C) Zygote formation (D) Cleavage

24. A person suffering from colour blindness cannot recognise :
(A) red and yellow colours (B) red and green colours
(C) blue and green colours (D) none of these

25. In human blood group AB :
(A) antibodies are present (B) antibodies are absent
(C) antibody a is present (D) antibody b is present

26. Purine base on DNA molecule has :
(A) A and C (B) C and T
(C) A and G (D) none of these

27. Which one is phenotypic ratio of Monohybrid cross?
(A) 1 : 2 : 1 (B) 3 : 1
(C) 9 : 3 : 3 : 1 (D) None

28. Sickle cell anaemia shows :
(A) Epistrasis (B) Co-dominance
(C) Pleiotropy (D) Incomplete dominance

29. Sickel-cell anemia is related to which type of disease ?
(A) Sex linked disease (B) Autosomal linked disease
(C) Deficiency disease (D) Metabolic disease

30. Name the genetic metrial in TMV (Tabacco Mosaic Virus).
(A) DNA (B) RNA single stranded
(C) RNA double stranded (D) R-DNA

31. The phenotypic ratio in a dihybrid cross is :
(A) 3 : 1 (B) 1 : 2 : 1
(C) 9 : 7 (D) 9 : 3 : 3 : 1

32. RNA differs from DNA in containing :
(A) phosphate (B) ribose
(C) deoxyribose (D) cytosine

33. Pyrimidines present in DNA are :
(A) Thymine and Cytosine (B) Adenine and Guanine
(C) Cytosine and Uracil (D) Thyminie and Uracil

34. How many codons are present inheritance codon ?
(A) 4 (B) 16
(C) 32 (D) 64

35. Synthesis of RNA on DNA template is known as :
(A) Translation (B) Trancription
(C) Transduction (D) Replication

36. DNA fingerprinting is :
(A) DNA typing (B) DNA Profiling
(C) Both 'A' and 'B' (D) base paring

37. Formation of m RNA from DNA is called :
(A) Transcription (B) Replication
(C) Translation (D) None

38. Stanley Miller's experiment supports :
(A) Chemical theory (B) Abiogenesis
(C) Biogenesis (D) Pangenesis

39. Darwin's finches are good example of :
(A) Connecting link (B) Adaptive radiation
(C) Convergent Evolution (D) Industrial melanism

40. Fossils are generally found in :
(A) sedimentary rocks (B) igneous rocks
(C) metamorphic rocks (D) any type of rock

41. Antibodies in our body are :
(A) Steroids (B) Lipoprotein
(C) Glycoprotein (D) All of these

42. Oncology is the study of :
(A) Cancer (B) Oncogenes
(C) Virus (D) Both 'A' and 'B'

43. Viruses are studied in :
(A) Phychology (B) Virology
(C) Bryology (D) Embryology

44. Which among the following is not a bacterial diseases ?
(A) Thyphoid (B) Leprosy
(C) Diptheria (D) Influenza

45. Food poisoning is due to the contamination of :
(A) Escherichia coli (B) Salmonella
(C) Clostridium (D) Pseudomonas

46. Which organ of body is most affected by excessive intake of alcohol :
(A) Lungs (B) Liver
(C) Stomach (D) Spleen

47. amp^R gene is responsible for developing resistance in :
(A) Pest (B) Insect
(C) Antibiotic (D) Drought

48. Leprosy disease is caused by :
(A) Bacteria (B) Virus
(C) Fungi (D) All of the above

49. Ent amoeba is a :
(A) Bacteria (B) Algae
(C) Protozoa (D) Fungi

50. The organisms which enrich the nutrient quality of the soil are called :
(A) Microbes (B) Biofertilizers
(C) Yeast (D) Biopesticides

51. Which disease is found in hen?
(A) Cholera (B) Birds Flu
(C) Ranikhet (D) All of these

52. The first transgenic cow was named as :
(A) Daisy (B) Maizy
(C) Dolly (D) Rosie

53. Cyanobacteria are useful biofertilizers in the field of :
(A) Maize (B) Wheat
(C) Sugarcane (D) Rice

54. Honey is made by :
(A) male honeybee (B) queen honeybee
(C) worker honeybee (D) both 'A' and 'B'

55. Masses of bacteria associated with fungal filament to form a mesh like structure is called :
(A) Flocs (B) Methanogen
(C) Plasminogen (D) None of these

56. Source of Eco RI enzyme is :
(A) Bam HI (B) E. coli
(c) both 'A' and 'B' (D) Hind III

57. Restriction enzymes are:
(A) Eco RI (B) Bam HI
(C) Hind III (D) All of these

58. Which of the following is the nematode that attacks the roots of tobacco plants ?
(A) Agrobacterium tumefaciens
(B) Rhizobium leguminosarum
(C) Meloidogyne incognita
(D) Taenia solium

59. Artificial seed is formed with the help of :
(A) Somatic embryo (B) Polyembryony
(C) Both 'A' and 'B' (D) None of these

60. RNAi is used to control pests on which plant ?
(A) Tobacco (B) Mango
(C) Potato (D) Poppy

61. Hermaphrodite organism is :
(A) hen (B) snake
(C) both 'A' and 'B' (D) earthworm

62. Which one of the following is insectivorous plant ?
(A) Drosera (B) Nepenthes
(C) Both 'A' and 'B' (D) Hydrilla

63. Who introduced term Ecosystem ?
(A) A.G. Tansley (B) Reiter
(C) Odum (D) Aristle

64. The main source of energy in ecosystem :
(A) Green plants (B) Sun
(C) Wind (D) All the above

65. In a National Park, protection is provided to :
(A) Flora (B) Fauna
(C) Ecosystem (D) Both Flora and Fauna

66. Which is hotspot of biodiversity in India ?
(A) Aravalli (B) Eastern Ghats
(C) Western Ghats (D) Indogangetic plain

67. Which one of the following is an endangered plant species of India ?
(A) Rauwolfia serpentina
(B) Santalum album (Sandal wood)
(C) Cycas beddonei
(D) All of the above

68. 5th June is :
(A) World Forest Day (B) World Red Cross Day
(C) World Environment Day (D) World Food Day

69. 'Green Muffler' is used against which type of pollution ?
(A) Soil (B) Water
(C) Air (D) Sound

70. Generally threshold of sound intensity for human is :
(A) 20-30 decibel (B) 80-90 decibel
(C) 120-130 decibel (D) 140-150 decibel

SECTION – B : Non-Objective Type Questions

SHORT ANSWER TYPE QUESTIONS

Directions : *Questions Nos. 1 to 20 are of short answer type. Each question carries 2 marks. Answer any ten questions of them in 50 words.* 10 × 2 = 20

1. **What is Enzyme linked Immuno-Sorbent Assay (ELISA) ?**
2. **What is DNA Probe? Give its application in Biotechnology.**
3. **Write important features of a sedimentary cycle in an ecosystem.**
4. **What is food web ? Name the organisms of two food chains in a terrestrial ecosystem.**
5. **Define Pyramid of energy.**
6. **Define Ex situ conservation.**
7. **Describe about initiation codon and termination codon.**
8. **What is gene mutation ? What is its role in organic evolution ?**
9. **What is the difference between the nucleoside and nucleotide ?**
10. **Describe the role of microbes in nitrogen fixation.**
11. **Write a note on Agrobacterium in brief.**
12. **Name the functions of the following :**
    (a) Corpus luteum, (b) Endometrium, (c) Acrosome
13. **What is infertility ?**
14. **How is corpus luteum formed ? What is its function ?**
15. **State the main points of chromosome theory of linkage.**
16. **Write a short note on haemophilia.**
17. **Write a brief note on AIDS.**
18. **Write about the following :**
    (a) Monoclonal Antibody
    (b) Interferon
    (c) Bioreactor
19. **Give the pathogen, mode of transmission, symptoms and prevention of disease-amoebiasis (amoebic dysentery).**
20. **Discuss the role of fishery in enhancement of food production.**

LONG ANSWER TYPE QUESTIONS

Directions : *Questions Nos. 21 to 26 are Long Answer Type Questions. Answer any 3 of them in 120 words.* 3 × 5 = 15

21. **Describe how microbes serve as biological control agents of plant diseases and pets.**
22. **What is Recombinant DNA technology ? Give the significance of this technique.**
23. **Describe the components of an ecosystem.**
24. **Define cross-pollination. Write the various agencies of cross-pollination.**
25. **Describe briefly the process of DNA fingerprinting. How does this process help in identifying criminals ?**
26. **What are the types of biofertilizers ? How does the Soil benefit from them?**

ANSWER WITH EXPLANATION

SECTION – A

OMR ANSWER-SHEET

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	36.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	37.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	38.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	39.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	40.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	41.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	42.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	43.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	44.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	45.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	46.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	47.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	48.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	49.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	50.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
16.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	51.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
17.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	52.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	53.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	54.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	55.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	56.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	57.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	58.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	59.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	60.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	61.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	62.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	63.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	64.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	65.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
31.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	66.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
32.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	67.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
33.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	68.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
34.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	69.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
35.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	70.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

ANSWER

1. (B)	2. (C)	3. (C)	4. (C)	5. (B)
6. (D)	7. (D)	8. (B)	9. (D)	10. (B)
11. (D)	12. (C)	13. (B)	14. (A)	15. (D)
16. (D)	17. (D)	18. (D)	19. (C)	20. (C)
21. (A)	22. (B)	23. (B)	24. (B)	25. (B)
26. (C)	27. (B)	28. (C)	29. (B)	30. (B)
31. (D)	32. (B)	33. (A)	34. (D)	35. (B)
36. (C)	37. (A)	38. (A)	39. (B)	40. (A)
41. (C)	42. (D)	43. (B)	44. (D)	45. (B)
46. (B)	47. (C)	48. (A)	49. (C)	50. (B)
51. (D)	52. (D)	53. (D)	54. (C)	55. (A)
56. (B)	57. (D)	58. (C)	59. (A)	60. (A)
61. (D)	62. (C)	63. (A)	64. (B)	65. (D)
66. (C)	67. (D)	68. (C)	69. (D)	70. (A)

SECTION – B

1. Enzyme linked Immuno-Sorbent Assay (ELISA) :

   (i) It is based on the principle of antigen-antibody interaction.

   (ii) Infection by pathogens can be detected by the presence of their antigens (proteins, glycoproteins, etc.) in body fluids/tissues or by detecting the antibodies synthesised by the host against the pathogen.

2. DNA Probe are small (15–30 bases long) nucleotide (DNA/RNA) sequences used to detect the presence of complementary sequences in nuclei acid samples. They are prepared in many ways and are either radioactively or non-radioactively labelled.

   Application : DNA probes can also be used for fluorescence in situ hybridization techniques, in which chromosomes are denatured on microscope slides. This method allows for the detection of larger chromosomal aberrations, including broken or fused chromosomes. Chromosome painting techniques utilize in situ hybridization to paint metaphase chromosomes different colours, which makes chromosome mapping easier. This technique can also be used to detect chromosome sequence that have been conserved between different species.

3. Phosphorus cycle is an example of sedimentary nutrient cycle since, it moves from land to the sediments at the bottom of the seas, then back to land again.

   The natural reservoir of phosphorus is Earth's crust. Rock contains phosphorus in the form of phosphates. By weathering and soil erosion, phosphates enter streams, rivers and then to oceans.

   With great movements of the crustal plates, sea floor is uplifted and phosphates become exposed on the drained land surfaces. From here, weathering over long periods of time releases phosphates.

   From rocks, minute amount of these phosphates dissolve in soil and are absorbed by the roots of the plants.

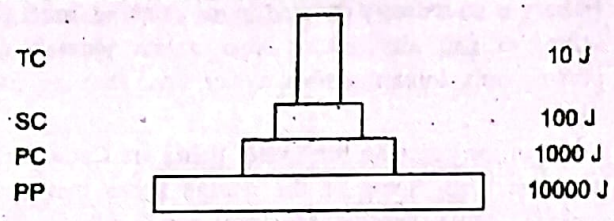
   Herbivores and other animals obtain this element from plants.

   The waste products and the dead organisms are decomposed by phosphate-solubilising bacteria releasing phosphorus.

4. **Food web**—A Network of food chains or feeding relationships by which energy and nutrients are passed on from one species of living organisms to another.

   Example—Gross→Dear→Tiger.

5. Pyramid of energy is the relationship between producers and consumers in an ecosystem in terms of flow of energy. It is always upright because energy is always lost as heat at each step.



An ideal pyramid of energy. Observe that primary producers convert only 1% of the energy in the sunlight available to them into NPP.

6. Ex situ conservation is the approach in which threatened animals and plants are taken out from their natural habitant and placed in special settings, where they can be protected and given special care.

   (a) Zoological parks, botanical gardens and wildlife safari parks are used for ex situ conservation.

   (b) There are many animals that have become extinct in the wildlife but continue to be maintained in zoological parks.

7. **Initiation Codon**—The codon present in the beginning of the cistron is known as initiation codon. It marks the beginning of its message for a polypeptide chain. Initiation codon in AUG and GUG (in bacteria).

   Termination Codon—There are three termination codon UAA, UAG and UGA. These codons are meant for termination of polypeptide chain.

8. Sudden heritable change in the chemistry of gene is known as gene mutation. They play major role in variation which is favoured by nature and lead to evolution of new species.

9. Difference between nucleoside and nucleotide are following :

Nucleoside	Nucleotide
1. A nucleoside consists of a nitrogenous base covalently attached to a sugar but without the phosphate group. 2. Several nucleoside used as antiviral or anti cancer agents.	1. A nucleotide consists of Nitrogenous base, a sugar and one to three phosphate group. 2. Malfunctioning nucleo-tides are one of the main causes of all cancers known to day.

10. **Role of microbes in nitrogen fixation :** Nitrogen-fixing micro organism like bacteria, cyanobacteria capable of transforming atmospheric nitrogen inorganic fixed nitrogen (organic form usable by plants). More than 90% of nitrogen is fixed by these organism which thus play an important role in the nitrogen cycle.

    Nitrogen fixation describes the conversion of nitrogen into nitrate which are taken by plants from the soil.

    All organism on earth require nitrogen survive, but most of them cannot use direct nitrogen.

    Some nitrogen fixing bacteria like Azotobacter are free living in the soil fixes nitrogen. Bacteria like Rhizobium found in root nodules of leguminous plants which fixes nitrogen symbiotically.

    Cynnobacteria like Anabeana, Nostoc can convert atmospheric nitrogen into an organic form which plants need for their growth and must obtain from soil.

11. **Agrobacterium :** Agrobacterium tumifaciences is a pathogen of several dicot plants which exhibit natural genetic engineering in plant. It is able to deliver a piece of DNA called 'T-DNA' to transform normal plant cell into a cells into tumour cell which direct them to produce the chemical essential for the pathogen.

12. (a) **Corpus luteum**—It secretes large amounts of progesteron which is essential for maintenance of the endometrium.

    (b) **Endometrium**—It helps in the implantation of the fertilised ovum and other events of pregnancy.

    (c) **Acrosome**—A cap like structure found in sperm that help fertilization of the ovum.

13. Inability to conceive or produce children even after 2 years of unprotected sexual cohabitation is called infertility. Various methods are now available to help such couples. In vitro fertilization followed by transfer of embryo into the female genital tract is one such method and is commonly known as the 'Test Tube Baby' Programme.

14. After ovulation the granulosa cells and the intenstitial cells form a mass of large and yellowish conical cells. This is named as corpus luteum.

    Functions : It serves as temporary endocrine gland by releasing progesterone and estrogen.

15. **Chromosome theory of linkage :**

    (a) The genes lie in linear order in the chromosome.

    (b) The distance between the linked genes determines the strength of linkage. The genes which are closely located show strong linkage than the widely placed genes that show weak linkage.

    (c) The genes that show the phenomenon of linkage are situated in the same chromosome.

    (d) The linked genes tend to maintain their original combination during course of inheritance.

16. It is a sex linked recessive disease which is transmitted from unaffected carrier female to male progeny. In this disease, a single protein is affected that is a part of the cascade of proteins involved in the clotting of blood. As a result of this, a simple cut results into non stop bleeding. The heterozygous female (carrier) for haemophilia may transmit the disease to sons. The possibility of a female to become haemophilic is extremely rare because mother of such a female has to be at least carried and the father should be haemophilic.

    The family pedigree of Queen Victoria has a number of haemophilic descendents as she was a carrier of the disease.

17. Acquired Immuno Deficiency Syndrom (AIDS) is transmitted by contact of infected cells-containing blood of a patient with the blood of a healthy person. It may spread by unprotected sex, using contaminated needles, rajors, needle for boring pinnae, transfusion of blood, organ transplant, artifical insemination, parturition from mother to baby.

The HIV virus is a retrovirus and diploid, it binds specifically to a surface receptor on a helper T-cell and introduces its RNA and reverse transcriptase enzyme into the cells. Then it produces DNA copy of itself and DNA copy is integrated into host cell genome. Then the virus genome directs the production of new virus particles. Rapid formation and release of new virus particles destroy the host cells. Full blown AIDS occur when the number of helper T-cells falls too low to fight the disease. Detection of AIDS is done by ELISA tests. Great care and preventive measures should be taken to prevent fast spread of the diseases. People under the high risk groups should be educated towards prevention and symptoms of the diseases. Upto date this diseases is 100% fatal.

18. **(a) Monoclonal Antibody :** It is monospecific antibodies that are same because they are made by identical immune cells that are all clons of a unique parent cell. Monoclonal antibodies have monovalent affinity in that they bind to the same epitope.

(b) Interferon : It is proteins made and released by host cells in response to the presence of pathogens such as viruses, bacteria, parasites or tumour cells. They allow for communication between cells to trigger the protective defences of immune system that the eradicate pathogens or tumours.

(c) Bioreactor—These are the vessels where raw materials are biologically converted into specific products, individuals enzymes etc. using microbial plant, animal or human cells. A bioreactor provides the optimum conditions for inchieving the desired products by providing optimal growth conditions.

A stirring type bioreactor consists of cylindrical structure or with a curved base for facilitating the mixing of reactor content and supply of oxygen throughout the bioreactor. Even the air can be bubbled through the reactor.

The bioreactor carries an agitator system, an oxygen delivery system, a from control system, temperature and pH control system so that small volumes of the culture can be taken out periodically.

19. **Pathogen :** Entamoeba histolytica.

Mode of transmission : It spreads through ingesting contaminated cysts with food and water (faecal oral route).

Symptoms :

(i) Pathogen erodes the mucus membrane of intestine and produces bleeding ulcers.

(ii) Mucus and blood comes along with stools.

20. Fishery is an industry devoted to the catching, processing or selling of fish, shellfish or other aquatic animals such as prawn, crab, lobster, edible oyster, etc., that are used for food.

Some of the common freshwater fishes are Catla, Rohu and common carp. Some of the marine fishes that are eaten include—Hilsa, Sardine, Mackerel and Pomfret.

21. Biocontrol refers to the use of biological methods for controlling plant diseases and pests. In agriculture, there is a method of controlling pets that relies on natural predation rather than introduced chemical.

The very familiar bettle with red and black marking the Ladybird, and dragonflies are useful to get rid of aphides and mosquitoes respectively. All example of microbial biocontral agents that can be introduced in order to control butterfly caterpillars is the bacteria Bacillus thuringenesis (often with ten as it.)

A biological control being developed for use in the treatment of plant diseases is the fungus trichoderma. Trichoderma species are free-living fungs that are very common in the root ecosystems. They are effective biocontrol agents of several plants pathogens.

Baculoviruses are pathogens that attack insects and other arthropod. The majority of baculoviruses used as biological control agents are in the genue Nucleo polyhedrovirus.

22. **Recombinant DNA technology**—It is a technique which permits the isolation of desired gene from any organism and its transfer and expression into the organism of choice. It is also termed as genetic engineering.

Significance :

(i) This technique is used to produce transgenic organism that possess novel capabilities i.e., to obtain novel pharmaceutical proteins. For example, human insulin is being commercially produced from transgenic Escherichia coli strain that contains and expresses the human insulin gene. Proteins produced by transgenes are called **recombinant proteins.**

(ii) Many valuable recominant proteins are also being produced using transgenic animal cell lines and transgenic plants. The animal recombinant proteins are used largely in industries for preparation of pharmaceutical products like vaccines and antibodies, the plant recombinant protein are new high value products and genetically modified food.

(iii) The recombinant proteins have great medical value which could not be produced on a commercial scale using the non-transgenic cells or organisms.

23. An ecosystem consists of two components—abiotic and biotic.

Abiotic component include the physical environmental factors, e.g., the water, soil, wind, sunlight, etc.

Biotic component includes :

(i) **Primary producers** or **the autotrophs,** e.g., plants, phytoplankton, some algae, etc. that can use sunlight to make food.

(ii) **Primary consumers** feed on the producers, the plants. The primary consumers are all **herbivores.**
Some common herbivores are insects, birds and mammals in terrestrial ecosystem and molluscs in aquatic ecosystem.

(iii) **Secondary consumers** are animals which eat planteating animals.
The consumers that feed on these herbivores are **primary carnivores** (though secondary consumers), e.g., spiders, beetles and birds.

(iv) **Tertiary consumers** eat secondary consumers. Animals that depend on the primary carnivores for food are labelled as **secondary carnivores,** e.g., owl, eagle and fox.

(v) **The decomposers** are the fungi, bacteria and other small organisms that breakdown the complex organic matter into inorganic substances like carbon dioxide, water and nutrients.

(vi) **Detritivores** e.g., earthworm, slugs, crabs and insects that breakdown detritus such as leaves, bark, flowers and dead remains of animals, including faecal matter into smaller particles.

24. Cross-Pollination—The transfer of Pollen grains from the anther of a flower to the stigma of another flower of different plants is called cross pollination. Pollination is prerequisite for fertilization the fusion of nuclei from the pollen grain with nuclei in the ovule. Fertilization allows the flower to develop seeds. Some flowers will develop seeds as a result of self pollination other plants require cross-pollination.

Various agencies of cross pollination is following :

(i) Hydrophily : pollination by water
(ii) Anemophily : pollination by wind
(iii) Zoophily : pollination by animals
(iv) Ornithophily : pollination by bird
(v) Chropterophily : pollination by bats
(vi) Mermecophily : pollination by ants
(vii) Molecophily : pollination by snails

25. DNA fingerprinting is a well-known method of identifying criminals by the means of their digital/palmer prints. It is a technique to find out variations in individuals of a population at DNA level. It works on the principle of polymorphism in DNA sequences.

PROCESS. Stated very simply, it works as follows :

1. The DNA is extracted from the nuclei of whatever evidence is available for e.g. from WBCs in case of blood sample or from hair follicle cells that cling to the roots of hair that have fallen or have been pulled out; or from spermatozoans in semen sample.
2. If the content of DNA is limited, DNA can be amplified by making many copies of it using PCR or Polymerase Chain Reaction.
3. The DNA sample is digested by a restriction enzyme which cuts the DNA into fragments at specific sites. The number of these sites present in an individual's DNA dictates the number and size of DNA fragments generated by the enzymes.
4. These fragments are separated by gel electrophoresis set up containing agarose polymer gel. The separated fragments can be visualised by staining them with a dye that fluoresces under ultraviolet radiation.
5. Double stranded DNA is then split into single stranded DNA using alkaline chemicals.
6. These separated DNA sequences are transferred to a nylon or nitrocellulose sheet placed over the gel. This is called 'Southern Blotting'.
7. The nylon sheet is then immersed in a bath and probes or markers that are radioactive, synthetic DNA segments of known sequences are added. The probes target a specific nucleotide sequences which is complementary to VNTR sequences and hybridizes them.
8. Finally, X-ray film is exposed to the nylon sheet containing radioactive probes. Dark bands develop at the probe sites which look something like the bar codes used to identify items at the grocery store.

The degree of variation is so high that every individual with the exception of identical twins, produces a unique band pattern, as every individual has a unique set of ordinary fingerprinting.

Identify of a criminal is determined by comparing the accused man's DNA with that of the blood or seminal stain found at the scene of the crime. If the DNA finger printings are identical, there is an absolute identification.

26. There are following type of biofertilizers and process to make fertile soil :

(i) **Azotobacter Biofertilizer**—Azotobacter is bacterium that live freely in the environment and has the ability to fix the atmospheric hydrogen into soil. It is important source of nitrogen,. It enables the plant to germinate and grow without being effected from any harmful microbes.

(ii) **Phosphate solublizers**—It have ability to dissolve the fixed phosphate and convert it in the form which can be utilized by plants. They produce enzyme, hormones and organic acid.

(iii) **Mycorrhia**—Micorrhia is the symbiotic relationship between the roots of the plant and fungi. Fungi makes colonies either intracellularly or extracellularly in the roots of the plants and provide nutrients to the plants which are helpful and its growth. Fungi are very useful for soil life.

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