

ENTRANCE TEST FOR Ph.D. PROGRAMME, 2023

BOTANY

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer all questions.**Each question carries 1 mark.*

Choose the correct answer from the choices given :

1. The "fruit" of a fig (*Ficus*) is :
 - a) Syconium.
 - b) Synandrium.
 - c) Syncarpous.
 - d) Synsepalous.
2. The monoxyle secondary vasculature is found in :
 - a) *Pinus*.
 - b) *Taxus*.
 - c) Both a) and b).
 - d) *Gnetum*.
3. The sporophytic perennial woody plants are mainly of :
 - a) Hydrophytic habit.
 - b) Xerophytic habit.
 - c) Psamphytic habit.
 - d) Both a) and c).
4. Root pressure is maximum when :
 - a) Transpiration is low and absorption high.
 - b) Both are low.
 - c) Both are high.
 - d) Transpiration is high and absorption low.
5. In certain flowering plants, the floral leaves are also called :
 - a) Prophylls.
 - b) Cataphylls.
 - c) Hypsophylls.
 - d) Sporophylls.

Turn over

6. The shape of polypeptide is :
- a) Maintained by bonding parts of the polypeptide.
 - b) Important to its function.
 - c) Dependent upon the primary structure.
 - d) All of the above.
7. Each ribosome contains :
- a) A-site.
 - b) P-site.
 - c) Both.
 - d) None.
8. Four bases in groups of three can yield how many different combinations ?
- a) 8.
 - b) 16.
 - c) 32.
 - d) 64.
9. In which sub-units, 28S and 5S r-RNA occur ?
- a) 30S.
 - b) 40S.
 - c) 50S.
 - d) 60S.
10. Recombination occurs only when the chiasma is located between the :
- a) Loci.
 - b) Genes and Chromosomes.
 - c) Two strands of DNA.
 - d) Cistrons.
11. Which one is an exception to Mendel's principle of dominance ?
- a) Wild pea.
 - b) Garden pea.
 - c) Maize.
 - d) *Mirabilis*.
12. Beta galactosidase hydrolyses :
- a) Lactose to glucose and galactose.
 - b) Glucose to glucose and lactose.
 - c) Lactose to fructose and glucose.
 - d) All the above.

13. Phenylmercuric acetate (PMA) results in :

- a) Killing of plants.
- b) Reduced transpiration.
- c) Reduced photosynthesis.
- d) Reduced respiration.

14. Which of the following chlorophyll pigment is found diatoms and brown algae ?

- a) Chlorophyll-a.
- b) Chlorophyll-b.
- c) Chlorophyll-c.
- d) Chlorophyll-e.

15. *E-coli* is capable of growth using the carbohydrate :

- a) Sucrose.
- b) Glucose.
- c) Galactose.
- d) All of the above.

16. New systematics differs from classical systematics in employing :

- a) All biological parameters.
- b) Biochemical and cytotaxonomy.
- c) Experimental taxonomy.
- d) Numerical taxonomy.

17. Piezoelectric effect is used in :

- a) MRI.
- b) FET.
- c) CT Scanning.
- d) Sonography.

18. Heterosis in *Nostoc* are meant for :

- a) Nitrogen fixation.
- b) Photosynthesis and photorespiration.
- c) Carbohydrate metabolism.
- d) Respiration.

19. Polar nodules are generally found in :

- a) Akinete.
- b) Heterocysts.
- c) Photosynthetic apparatus.
- d) Cyanophycean cell wall.

Turn over

20. Incipient nucleus is found in :
- a) Gymnosperms of high altitude.
 - b) Pterophytes.
 - c) Angiosperms.
 - d) Cyanobacteria.
21. Nitrogenomics is the study of :
- a) Pyrimidine base.
 - b) Nitrogen utilization.
 - c) Purine study.
 - d) Ammonia utilization.
22. Cytokinins are synthesized in :
- a) Shoots.
 - b) Roots.
 - c) Leaves.
 - d) Shoot tips.
23. Which hormone activates cellular elasticity ?
- a) GA_3 .
 - b) Ethylene.
 - c) Cytokinin.
 - d) Auxin.
24. Wobble effect is :
- a) Lack of precision with regard to the third base in codon and anticodon.
 - b) Instability of the DNA molecule when unwound.
 - c) Instability of pairing when a purine pairs with another purine.
 - d) All of the above.
25. The term bio-indicators cover a wide spectrum of organisms serving as indicators of :
- a) Climate.
 - b) Air.
 - c) Water.
 - d) Environment.
26. Benzene is a :
- a) Solid pollutant.
 - b) Gaseous pollutant.
 - c) Disinfectant.
 - d) None of the above.
27. "Tip Burn" occurs due to accumulation of :
- a) Fluoride.
 - b) CFC.
 - c) Mercury.
 - d) Lead.

28. In which of the following families "Ruminate Endosperm" is commonly found in the seed ?
- a) Euphorbiacea.
 - b) Annonaceae.
 - c) Cruciferae.
 - d) Compositae.
29. $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$ is the structure of :
- a) Palmitic acid.
 - b) Oleic acid.
 - c) Palmitoleic aci.
 - d) Stearic acid.
30. Genetic material possessing the dual capacity to exit either as extrachromosomal or chromosomal entity is called :
- a) Episome.
 - b) Autosome.
 - c) Mesosome.
 - d) Oxysome.
31. In which of the following, a single stranded DNA is present ?
- a) X-74.
 - b) $\phi \times 174$.
 - c) TMV.
 - d) All these.
32. With which of the following, nucleosomes are attached or linked ?
- a) Histone H_4 .
 - b) Linker DNA.
 - c) Histone H_2A .
 - d) Histone H_2B .
33. The first step of β oxidation involves the activation of fatty acid in the presence of :
- a) Ca^{++} and thiokinase enzyme.
 - b) ATP and thiokinase enzyme.
 - c) ATP and β ketoacyl thiolase.
 - d) ATP and aldehyde dehydrogenase.
34. Cladograms are interpreted as :
- a) Family tree.
 - b) Class tree.
 - c) Order tree.
 - d) Genera tree.
35. The founder effect is an example of :
- a) Limiting factor.
 - b) Lampbrush Chromosome.
 - c) Lambda phage.
 - d) Genetic drift.

Turn over

36. The scientist performing RAPD creates several arbitrary, short primers, then proceeds with PCR using :
- a) A large template of genomic DNA.
 - b) A small template of genomic DNA.
 - c) PCR primer.
 - d) *Taq* polymerase.
37. As a result of gene duplication, vertebrate genomes often contain two or more homologous genes corresponding to :
- a) Single gene in the fly.
 - b) Double genes in the fly.
 - c) Triple genes in the fly.
 - d) Four genes in the fly.
38. If each somatic cell of a human male contains a single Barr body in its nucleus, the most likely genetic constitution of the person will be :
- a) XXYY.
 - b) XXY.
 - c) XO.
 - d) XYY.
39. PCD in flowering plants prevents :
- a) Stem formation.
 - b) Inbreeding.
 - c) Outbreeding.
 - d) Root formation.
40. Allergic reactions are related with :
- a) IgE.
 - b) IgD.
 - c) IgG.
 - d) IgM.
41. For a T cell to recognize an antigen, it must interact with :
- a) Complement.
 - b) B Cells.
 - c) T Cells.
 - d) Macrophage.
42. The chemical formula of chlorophyll a is :
- a) $C_{77}H_{55}O_6N_4Mg$.
 - b) $C_{55}H_{70}O_6N_4Fe$.
 - c) $C_{55}H_{72}O_5N_4Mg$.
 - d) None of the above.

43. If the centromere is near the middle of the chromosome, the two arms of the chromosomes are nearly equal. The chromosomes then appear :
- a) T-Shaped.
 - b) J-Shaped.
 - c) V shaped.
 - d) All of the above.
44. The major supply of energy in the form of ATP is obtained from :
- a) Fermentation.
 - b) Krebs cycle.
 - c) Fatty acid metabolism.
 - d) All of the above.
45. The m-RNA becomes associated with the ribosomes which acts as template for protein synthesis. At this template energy is supplied by :
- a) ATP and Mg^{++} .
 - b) ADP and Mg^{++} .
 - c) AMP and Mg^{++} .
 - d) GDP and Mg^{++} .
46. Neocentromeres have been reported in :
- a) *Pisum sativum*.
 - b) *Dolichus lablab*.
 - c) *Zea mays*.
 - d) *Mangifera indica*.
47. Tocopherol exists in :
- a) 2 different forms.
 - b) 3 different forms.
 - c) 4 different forms.
 - d) Only 1 form.
48. Protein part of the enzyme is called :
- a) Apoenzyme.
 - b) Prosthetic group.
 - c) Holoenzyme.
 - d) Chymotrypsinogen.
49. A cell is cancerous. Where might you find an abnormality ?
- a) Only in the nucleus.
 - b) Only in the cytoplasmic reactions.
 - c) In any part of the cell concerned with growth and cell division.
 - d) Only in the plasma membrane receptors.

Turn over

50. Photosystem-I has :

- a) Less chlorophylls and less accessory photosynthetic pigments.
- b) Less chlorophylls and more accessory photosynthetic pigments.
- c) More chlorophylls and more accessory photosynthetic pigments.
- d) More chlorophylls and less accessory photosynthetic pigments.

(50 × 1 = 50 marks)

Part B

Answer any ten questions.

Each question carries 5 marks.

- 51. Give a general account on the differences between experimental taxonomy and classical -taxonomy.
- 52. Explain Hatch and Slack cycle with appropriate figure.
- 53. How would you set up a tissue culture experiment for medicinally important crops found in your locality ?
- 54. State the significance of TCA cycle. Explain the cycle in brief.
- 55. Why is the p53 protein so important ? How does the cell rectify DNA damage on its own ?
- 56. Explain the various methods for silencing a gene.
- 57. How is the process of glycolysis regulated ?
- 58. State the significance of Michaelis-Menten Equation. What do you mean by feedback inhibition ?
- 59. Differentiate between ecological niche and habitat. State the significance of Lotka-Volterra model.
- 60. How does the gene transfer mechanism take place in bacteria ? Explain with appropriate figures
- 61. Give a brief account on ESR and NMR spectroscopy.
- 62. Codominant markers are preferred over dominant markers. Justify the statement
- 63. Give a general account on genome sequencing database.
- 64. Discuss extension of Mendelian principles with examples.

(10 × 5 = 50 marks)