

Ph.D. ENTRANCE EXAMINATION, APRIL 2022

BOTANY

Time : Two Hours

Maximum : 100 Marks

Part I

*Attempt all the questions.**Put a mark after correct answer.**All questions carry 1 mark each.*

1. Which of the following high energy molecule is used for sucrose biosynthesis ?
(A) ATP. (B) GTP.
(C) CTP. (D) UTP.
2. During which of the following stages of *Arabidopsis* embryogenesis, focused cell division in two regions takes place on either side of the future shoot apical meristem to form the two cotyledons ?
(A) Torpedo stage. (B) Globular stage.
(C) Zygotic stage. (D) Heart stage.
3. Which one of the following is the chromophore of the photoreceptor phytochrome ?
(A) Phytochromobilin. (B) Methyl tetrahydrofolate.
(C) FAD. (D) FMN.
4. Which of the following phytohormone can act as the positive regulator of senescence ?
(A) Auxin. (B) Cytokinin.
(C) Absciscic acid. (D) Gibberellin.
5. There are several different classes of Heat shock proteins (HSPs), among them _____ can bind and release misfolded proteins ?
(A) HSP 70. (B) HSP 60.
(C) HSP 90. (D) HSP 101.

Turn over

6. In certain plants, the mechanism where timing of anther dehiscence and stigma receptivity do not coincide to avoid self-pollination is called :
- (A) Dichogamy. (B) Herkogamy.
(C) Monoecy. (D) Dioecy.
7. _____ is the enzyme that transfers the amide group of glutamine to 2-oxoglutarate.
- (A) Glutamine synthetase. (B) Glutamate synthase.
(C) Glutamate dehydrogenase. (D) None of the above.
8. Which of the following repair pathway require hemi methylated DNA for repairing the damage ?
- (A) Base excision repair. (B) Photoreactivation.
(C) Nucleotide excision repair. (D) Mismatch repair.
9. Reserve food material in the brown algae (Phaeophyceae) is _____.
- (A) Floridean starch. (B) Laminarin and Manitol.
(C) Chrysolaminarin. (D) Starch.
10. The main structural component of the exine is _____.
- (A) Tryphine. (B) Sporopollenin.
(C) Chemocyanin. (D) Primexine.
11. Which of the following GTPase is the master regulator of pollen tip growth ?
- (A) ROP 1. (B) RLK.
(C) RLP. (D) RICs.
12. In *Arabidopsis* endosperm development, which one of the following gene mutation results in autonomous endosperm development in the absence of fertilisation and embryo formation ?
- (A) FIS. (B) DEK 1.
(C) CRINKLY 4. (D) HAIKU.
13. Active site of Topoisomerase I contains which of the following amino acid residue ?
- (A) Tryptophan. (B) Lysine.
(C) Arginine. (D) Tyrosine.

14. Which of the following plant pathogen cause Rust disease in Coffee ?
(A) *Colletrichum coffeanum*. (B) *Hemileia vastatrix*.
(C) *Exobasidium vexans*. (D) *Phytophthora capsica*.
15. The Scientist who first proposed the involvement of hormone in fungi for the sexual reproduction was _____.
(A) Buller. (B) Alexopoulos.
(C) De Bary. (D) Gaeuman.
16. Transcription inhibitor of both prokaryotes and eukaryotes is _____.
(A) Actinomycin D. (B) Rifamycin.
(C) α -amanitin. (D) Streptolydigin.
17. Lac repressor is a _____.
(A) Dimer. (B) Tetramer.
(C) Dimer of dimer. (D) None of the above.
18. The chilling treatment of seeds to break the seed dormancy is referred as _____.
(A) Vernalisation. (B) Scarification.
(C) Stratification. (D) Vitrification.
19. Lac operon consists of 3 operators, among them which of the following is the primary operator ?
(A) O₁. (B) O₁ and O₂.
(C) O₃. (D) O₂.
20. On the basis of ABC model during flower development, the loss of class B results in the formation of sepals and carpels only. Which of the following organ identity genes control the class B activity?
(A) APETALA 2 and PISTILLATA. (B) APETALA 3.
(C) PISTILLATA and AGAMOUS. (D) APETALA 3 and PISTILLATA.
21. The nod factors (Nodulation factors) are _____.
(A) Lipoproteins. (B) Lipochitin oligosaccharides.
(C) Glycoproteins. (D) Peptidoglycans.

22. Tobacco mosaic virus (TMV) is a _____.
- (A) Linear, Single stranded, Positive strand RNA.
 - (B) Linear, Single stranded, Negative strand RNA.
 - (C) Linear, Double stranded, Segmented, Positive strand RNA.
 - (D) Circular, Double stranded DNA.
23. Lateral roots are developed from which of the following cells _____.
- (A) Epidermis.
 - (B) Stele.
 - (C) Endodermis.
 - (D) Pericycle.
24. Which of the plant genera exhibit this condition in monosporic type (4 celled 4 nucleated condition) of development ?
- (A) Polygonum.
 - (B) Oenothera.
 - (C) Pepperomia.
 - (D) Allium.
25. How many sub units are there in the Rubisco, the predominant protein in plant leaves ?
- (A) 16.
 - (B) 8.
 - (C) 9.
 - (D) 12.
26. The photorespiration takes place in three compartments. In which of the following compartment the carbon dioxide and NH_4^+ released ?
- (A) Mitochondria.
 - (B) Chloroplast.
 - (C) Peroxisome.
 - (D) Endoplasmic reticulum.
27. Polyadenylation is carried out by Poly (A) polymerase, The Poly (A) polymerase is a _____.
- (A) RNA dependent RNA polymerase.
 - (B) Template dependent RNA polymerase.
 - (C) RNA Dependent DNA polymerase.
 - (D) Template independent RNA polymerase.

28. Cyanide is an inhibitor of electron transport chain ; it can inhibit which among the following complex _____.
- (A) Complex IV. (B) Complex III.
(C) Complex II. (D) Complex I.
29. Philadelphia chromosome is formed by the chromosomal translocation of which of the following chromosomes ?
- (A) Chromosome 8 and 21. (B) Chromosome 9 and 21.
(C) Chromosome 9 and 22. (D) None of the above.
30. Which of the following chlorophyll has pyrrole ring II that contains methyl group(-CH₃) ?
- (A) Chlorophyll a. (B) Chlorophyll b.
(C) Chlorophyll a and b. (D) None of the above.
31. Endomycorrhizal association predominantly reduce _____ limitation ?
- (A) Phosphorous. (B) Nitrogen.
(C) Sulphur. (D) Potassium.
32. _____ is most abundant in the phloem sap of a plant ?
- (A) Proteins. (B) Phosphates.
(C) Organic acids. (D) Sugars.
33. The quantum yield of oxygen evolution during photosynthesis drastically drops in far-red light. This effect is known as _____.
- (A) Red drop effect. (B) Blue drop effect.
(C) Far red drop effect. (D) None of the above.
34. During C₃ in green leaves, net production of one molecule of glyceraldehyde 3-phosphate requires one of the following combinations of energy equivalents _____.
- (A) 9 NADPH and 6 ATP. (B) 3 NADPH and 9 ATP.
(C) 2 NADPH and 3 ATP. (D) 6 NADPH and 9 ATP.

35. The chlorosis (yellowing) symptom of iron deficiency is influenced by :
- (A) Sodium. (B) Potassium.
(C) Sodium and phosphorous. (D) Potassium and phosphorous.
36. A persistent calyx growing in size along with the fruit is called as _____.
- (A) Accrescent calyx. (B) Marcescent calyx.
(C) Deciduous calyx. (D) Caducous calyx.
37. A flower with two whorls of stamens of which outer ones are opposite to petals is called _____.
- (A) Diplostemonous. (B) Obdiplostemonous.
(C) Haplostemonous. (D) Didynamous.
38. _____ is the additional specimen collected from the same locality from where the holotype was previously collected.
- (A) Topotype. (B) Lectotype.
(C) Syntype. (D) Paratype.
39. Fertilisation in dictyota is _____.
- (A) Internal. (B) External.
(C) Both. (D) None of the above.
40. Dry schizocarp that develops from bicarpellary, syncarpous, superior ovary is _____.
- (A) Mericarp. (B) Cremocarp.
(C) Carcerulus. (D) Lomentum.
41. _____ is an insoluble protein and the main component of hair, finger nails.
- (A) Fibroin. (B) Collagen.
(C) Elastin. (D) Keratin.
42. Which one of the following is **NOT** a Nucleic sequence database ?
- (A) DDBJ. (B) TrEMBL.
(C) Gen Bank. (D) GSDB.

43. Which is the longest phase in cell cycle ?
(A) M phase. (B) G_1 phase.
(C) G_2 phase. (D) S phase.
44. Which one of the following is **NOT** a transition inducing chemical ?
(A) 5 Bromouracil.
(B) Ethyl methane sulphonate.
(C) Hydroxylamine.
(D) Benzopyrene.
45. Sugar pucker in Z DNA is _____.
(A) C3'-endo.
(B) C2'-endo.
(C) C2'-endo for pyrimidines ; C3'-endo for purines.
(D) C2'-endo for purines : C3' endo for pyrimidines.
46. Initiator t-RNA binds to which one of the following binding sites of ribosome ?
(A) P site. (B) A site.
(C) E site. (D) In between A and P.
47. In mitochondrial DNA genetic code 'AGA' codes for _____.
(A) Methionine. (B) Stop codon.
(C) Serine. (D) Arginine.
48. According to wobble concept the Inosine in anticodon did not pair with which one of the following base in codon ?
(A) Adenine. (B) Uracil.
(C) Cytosine. (D) Guanine.
49. HAT is _____.
(A) Histone amido transferase. (B) Histone amino transferase.
(C) Histone acetyl transferase. (D) Histone acyl transferase.

Turn over

50. The phytohormone that breaks seed dormancy is _____.

- (A) Auxin. (B) Gibberellin.
(C) Ethylene. (D) Absciscic acid.

(50 × 1 = 50 marks)

Part II

*Attempt all the questions.
Questions carries 5 marks each.*

1. Write an account on transposable elements ?
2. Describe the various inhibitor of translation in both eukaryotes and prokaryotes ?
3. Explain different categories of mutations ?
4. Explain in detail the prokaryotic DNA replication and its regulation ?
5. Give an account on different fruit types ?
6. Briefly explain stelar evolution in pteridophytes with examples ?
7. Describe the life cycle in algae ?
8. Given an account on protein sequence data bases ?
9. Describe the photoreceptor phytochrome and its mechanism in photomorphogenesis ?
10. Differentiate *in-situ* and *ex-situ* conservation ?

(10 × 5 = 50 marks)