



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours PART-III Examinations, 2018

**BOTANY-HONOURS**  
**PAPER- BOTA-VII**

Time Allotted: 4 Hours

Full Marks: 100

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

1. Answer the following questions in brief:
  - (a) Why water potential of a cell is always negative? 1
  - (b) What is meant by P/O ratio? 2
  - (c) Write down the biochemical reaction of TCA cycle only where the substrate level phosphorylation takes place. 2
  - (d) What is 'nod' gene? 1
  - (e) Write down the visible range of light spectrum required in photosynthesis. 1
  - (f) What is critical day length? 1
  - (g) Name the precursors of Auxin and Ethylene. 2
  
2. Answer any **four** questions from the following: 5×4 = 20
  - (a) Explain the "mass flow hypothesis" of phloem transport. 5
  - (b) Discuss the role of K ion and blue light in stomatal movement. 5
  - (c) Write down the irreversible reactions taking place during glycolysis. 5
  - (d) Schematically present the Z-Scheme (N-Scheme) of photosynthetic light reaction. 5
  - (e) State the physiological roles of cytokinin. 5
  - (f) Briefly discuss the phytochrome mediated photomorphogenetic responses in plant. 5
  - (g) Describe the process of nitrate assimilation in plants. 5
  - (h) Distinguish between oxidative phosphorylation and photophosphorylation. 5
  
3. Answer any **three** questions from the following: 10×3 = 30
  - (a) What is chloroplast dimorphism in C<sub>4</sub> plants? Schematically present the NADP-ME type and PEP-CK type of CO<sub>2</sub> concentrating mechanism in C<sub>4</sub> plants. 2+4+4
  - (b) Differentiate between symbiotic and non-symbiotic di-nitrogen fixation. Elucidate the biochemical events of di-nitrogen fixation with reference to Nitrogenase complex in legumes. 2+(6+2)

- (c) How does innate dormancy differ from induced dormancy? What are the causes of seed dormancy? Discuss briefly the methods of breaking dormancy in seeds. 2+2+6
- (d) Schematically present the biochemical reactions of oxidative pentose phosphate pathway. Mention the sub-cellular locale of this pathway. State the metabolic significance of Hexose monophosphate shunt. 7+1+2
- (e) Write down the chemical structure of a natural and a synthetic auxin. Schematically present the biosynthesis of IAA from Tryptophan. Name two synthetic auxin used in agriculture. 2+6+2
- (f) Indicate the basic features of a Signal Transduction pathway. Explain the G-protein mediated signal transduction in plants. 3+7
4. Answer the following questions: 5×4 = 20
- (a) What are secondary metabolites? How do they differ from primary metabolites? Give examples. 1+3+1
- (b) Discuss the role of flavonoids against pathogens. 5
- (c) Write down the chemical classification of drugs. 5
- (d) Give a brief account on alkaloids. Mention the role of quinine and reserpine. 3+2
- OR**
- (a) Name two phytosteroids. Mention their sources and from which part(s) they are obtained. Briefly describe their usefulness in pharmacognosy. 2+2+2+4
- (b) Mention the scientific name of source plants, parts used and major uses of the following: (1+0.5+1) × 4
- (i) Gingerol (ii) Digitoxin (iii) Barbalion (iv) Vinblastine.
5. Answer the following questions in brief:
- (a) What is organogenesis in plant tissue culture? 1
- (b) What are genomic and cDNA libraries? 2
- (c) Differentiate between cloning vector and expression vector. 2
6. Answer any **one** question from the following: 5×1 = 5
- (a) What is cell suspension culture? Point out its importance. 2+3
- (b) Distinguish between organogenesis and somatic embryogenesis. 5
7. Answer any **one** question from the following: 10×1 = 10
- (a) Elucidate the role of vectors in genetic engineering. Discuss the strategies employed for gene transfer using Ti plasmid. State the different types of restriction endonuclease employed in recombinant DNA technology. 2+5+3
- (b) Define haploid culture. Describe the method and importance of haploid culture in plants. 2+4+4



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**Group-A**

1. Answer the following in brief:
  - (a) What is the difference between SEM and TEM? 2
  - (b) What is CENP? 1
  - (c) What is karyotype? 1
  - (d) What is G banding? 1
  
2. Answer any *two* questions from the following: 5×2 = 10
  - (a) Differentiate between meiotic division I and II. Mention the significance of meiosis. 3+2
  - (b) Write down the characteristic feature of cpDNA. How does it differ from mtDNA? 3+2
  - (c) What is NOR? State its role in ribosome biogenesis. 1+4
  
3. Answer any *one* question from the following: 10×1 =10
  - (a) Give a note on chromatin organization and DNA packaging with proper diagram. Distinguish between euchromatin and heterochromatin. 7+3
  - (b) Draw and describe the ultra-structure of nuclear pore complex. Briefly discuss the endo membrane system of an eukaryotic cell. 5+5

**Group-B**

4. Answer the following in brief:
  - (a) What is homoeologous chromosome? 1
  - (b) What is complete linkage? 1
  - (c) Distinguish between autopolyploidy and allopolyploidy. 2
  - (d) Why do lagging strands of DNA replicate discontinuously? 2
  - (e) What is split gene? 2
  - (f) Distinguish between epistasis and dominance. 2
  
5. Answer any *three* questions from the following: 5×3 = 15
  - (a) Explain with proper diagrams the molecular mechanism of crossing-over. 5
  - (b) What are transposable elements? Explain it with reference to AC-DS element in maize. 1+4

- (c) Give a brief illustrated account of RNA processing. 5
- (d) Describe the meiotic behaviour of reciprocal translocation with diagram. 5
- (e) What is maternal inheritance? Elucidate with example. 1+4
6. Answer any **three** questions from the following: 10×3 = 30
- (a) Describe Meselson and Stahl's experiment confirming the semi conservative nature of DNA replication. What is central dogma? 8+2
- (b) Describe the Nirenberg and Leder's experiment deciphering the genetic code. What do you mean by Wobble hypothesis? Is genetic code universal? 7+2+1
- (c) Give an account of the enzymes required for prokaryotic DNA replication and state their specific functions. Why RNA primers are essential for replication? What is nick translation? 7+2+1
- (d) Write a note on mutagens. Describe transition, transversion and Frame-shift types of mutations. 4+6
- (e) Three recessive genes in linkage group V of tomatoes are – 'a' causing absence of anthocyanin pigment, 'hi' causing hair less plant and 'J' causing joint less fruit stems. Among 3,000 progenies from a test cross the following phenotypes were obtained.
- |   |     |
|---|-----|
| Hair Less                               | 259 |
| Joint less, Hair Less                   | 40  |
| Joint Less                              | 931 |
| Normal                                  | 260 |
| Anthocyanin less, Joint less, Hair less | 268 |
| Anthocyanin less, Hair less             | 941 |
| Anthocyanin less                        | 32  |
| Anthocyanin less, Joint less            | 269 |
- (i) How were the genes in parents?
- (ii) Determine linear order of genes.
- (iii) Calculate map distances between genes.
- (iv) Calculate coefficient of coincidence and interference.

**Group-C**

7. Answer the following in brief:
- (a) Define heterosis. 2
- (b) What is restorer line? 1
- (c) Differentiate between back cross and test cross. 2
8. Answer any **one** question from the following: 5×1 = 5
- (a) Write a note on laws of probability.
- (b) Explain Hardy-Weinberg equilibrium.
9. Answer any **one** question from the following: 10×1 = 10
- (a) Distinguish between bulk method and pedigree method. What are the merits and demerits of pure line selection? 5+5
- (b) Calculate the mean, standard deviation and standard error of the height of the plants as given below (measured in cms.) 10
- 139, 122, 120, 122, 126, 129, 134, 131, 132, 139, 132, 118, 122, 120, 124.