

2021

BOTANY

PAPER-II

Time Allowed — 3 Hours

Full Marks — 200

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

Answers may be given either in **English** or in **Bengali** or in **Nepali** but all answers must be in one and same language.

Answer any five questions.

40×5=200

1. Answer any four from the following:

(a) Answer very briefly:

- (i) Nomenclature of fatty acids
- (ii) Antibiotics inhibit 'transcription' process
- (iii) RNA editing

3+3+4=10

(b) Distinguish between:

- (i) Homeotic gene and Caretaker gene
- (ii) T-DNA and P-Protein
- (iii) DNA zymes and DNA aptamers

3+4+3=10

(c) Explain with diagram:

- (i) ATP synthase complex
- (ii) mRNA capping and polyadenylation
- (iii) Enumerate the structural details of plasma membrane

3+4+3=10

(d) Describe in brief:

- (i) Cryptochrome
- (ii) Supersecondary structure of protein
- (iii) Pericentric inversion

3+4+3=10

(e) Justify the statements:

- (i) Plasma membrane is asymmetric in structure.
- (ii) rho protein helps to terminate transcription process.
- (iii) Non-Mendelian inheritance.

3+3+4=10

2. Answer any four from the following:

(a) (i) Calculate the centrifugal force at a radius of 10cm rotor spinning at 15,000 rpm. ( $g = 9.81 \text{ ms}^{-2}$ )(ii) When long chain fatty acids are oxidized to  $\text{CO}_2$  and  $\text{H}_2\text{O}$ , the following types of reactions are encountered:

- (A) A reaction in which a carbon-sulfur bond is formed.
- (B) A reaction that involves the breaking of carbon-carbon bond.

Indicate co-factors, enzymes in the above reactions.

4+6=10

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Please Turn Over

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- (b) Explain with reasons:
- (i) Distinguish between nullisomic and double monosomic. 5+5=10
  - (ii) Explain central dogma of molecular biology. 5+5=10
- (c) Identify two major structural differences in B-form and Z-form of DNA. What is the role of topoisomerase in DNA replication? What is Linking number (Lk)? What will be the Lk in 400 base pair DNA? 3+3+3+1=10
- (d) Write short notes on:
- (i) Tight junction and Desmosome 2.5×2=5
  - (ii) Characterise different subunits of Nitrogenase complex. Mention the role of these subunits in nitrogen fixation. 2+3=5
- (e) Compare the following:
- (i) nif gene and nod gene
  - (ii) RNA polymerase of prokaryote and eukaryote
  - (iii) Nitrification and ammonification 3+3+4=10
3. Answer *any four* from the following:
- (a) Discuss the role of phytochrome in flowering. 10
  - (b) Describe with diagram:
    - (i) Different stages of Prophase I of meiosis
    - (ii) Characteristics of cp DNA
    - (iii) What is volatile buffer? Name one volatile buffer used for protein analysis. 4+4+2=10
  - (c) What is photorespiration? Comment in detail on compartmentation of biochemical events in photorespiration. 2+8=10
  - (d) Compare between:
    - (i) Southern blot and Western blot
    - (ii) Omega 3 and omega 6 fatty acids 6+4=10
  - (e) Describe briefly:
    - (i) Role of auxin in phototropism.
    - (ii) Non-cyclic photophosphorylation. 5+5=10
4. Answer *any four* from the following:
- (a) Explain briefly:
    - (i) Genetic code is Degenerative and Ambiguous.
    - (ii) What is km?
    - (iii) What is Go phase? 6+2+2=10
  - (b) Write a brief note on different methods of Gene transfer in plants. 10
  - (c) Explain briefly: 5×2=10
    - (i) Autopolyploid
    - (ii) Allopolyploid

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- (d) (i) Write down in flow chart the steps of glycolysis with the name of the enzymes. 6+4=10  
(ii) What do you mean by substrate level phosphorylation and oxidative phosphorylation? 5+5=10
- (e) (i) What is glyoxylate cycle? Describe it in flow chart. 6+4=10  
(ii) Mention the major event of CO<sub>2</sub> fixation through CAM cycle. 5+5=10

5. Answer any four from the following:

- (a) (i) Classify secondary metabolites according to their chemical structure and with example. 5+5=10  
(ii) Write the systematic position of *Cinchona*, *Ipecac*, *Adhatoda* and *Curcuma*. 5+5=10
- (b) Distinguish between holoenzyme, apoenzyme, coenzyme and cofactor. 10
- (c) Define:  
(i) What is isoelectric focusing?  
(ii) Explain Fischer's and Koshland's model for substrate-enzyme complex.  
(iii) What is abzyme? 2+6+2=10
- (d) Enumerate:  
(i) What is molar extinction coefficient?  
(ii) What is the difference in application of Colorimeter and Spectrophotometer?  
(iii) What is somatic hybridization?  
(iv) What is the principle for ELISA operation? 2+2+3+3=10
- (e) Explain in brief:  
(i) Role of Jasmonic acid and Salicylic acid as primary defence signalling molecules under abiotic and biotic stress.  
(ii) Fatty acid synthase of prokaryotes and eukaryotes. 5+5=10

6. Answer any four from the following:

- (a) (i) What do you mean by 'Normal distribution'?  
(ii) What do you mean by frequency class interval?  
(iii) Some seeds were classified in terms of color (white and red) and in terms of shapes (round, square) to observe whether there is any relationship between color and shapes. Data were tabulated from 105 seeds and presented in 2 rows and 2 columns. To check null and alternative hypothesis:  
(A) Seed shape is not associated with color.  
(B) Shape is associated with color.

(Observed count)	Round	Square	Total
White color	36	14	50
Red color	30	25	55
Totals	66	39	105

Compute the Chi square value and justify your statement.

[Table value for 1 degrees of freedom at 0.10 is 2.706 and 0.05 is 3.841]

2+2+6=10

- (b) (i) What is Hexose Monophosphate Shunt? What is its biological significance? 6+4=10  
(ii) What is Phytochelatin? Give example.

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- (c) (i) Describe the role of ribosome in eukaryotic protein synthesis. 5+5=10  
(ii) What is snoRNA? Mention its role in pre-rRNA processing.
- (d) (i) What are the basic composition of MS media?  
(ii) What are the essential fatty acids and essential amino acids? Give examples in each case. 2+3+5=10  
(iii) What is Sanger's reagent? What is its role in protein sequencing? 5+5=10
- (e) Role of GA in seed germination and flowering.

7. Answer any four from the following:

- (a) Explain in brief:  
(i) Sugar pucker in DNA  
(ii) Base analog in mutation 4+3+3=10  
(iii) DNA methylation
- (b) Explain schematically the major pathways for production of secondary metabolites. 10  
(i) MVA  
(ii) Shikimic acid  
(iii) MEP pathways
- (c) (i) What do you mean by metabolic engineering?  
(ii) What is glycocalyx? 5+2+3=10  
(iii) In which principle does Scanning Electron Microscope work?
- (d) Distinguish between crossing over, translocation and inversion (pericentric and paracentric) of chromosome. Explain with diagram. 10
- (e) Briefly discuss the nucleosome model of chromosome. 10

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