Total number of printed pages-7

14 (BOT-2) 2036

#### 2024

#### BOTANY

### Paper : BOT-2036

### (Plant Physiology and Biochemistry)

## Full Marks : 80

Time : Three hours

# The figures in the margin indicate full marks for the questions.

The levels of Bloom's Taxonomy are indicated within bracket [] at the end of each question.

Answer **all** the questions.

- 1. Choose the correct answer of the following questions from the options given below: 1×10=10
  - (i) Identify the main function of ion channels in biological membranes. [K1]
    - (a) Facilitate osmosis
    - (b) Regulate membrane potential
    - (c) Assist in active transport
    - (d) Maintain lipid bilayer integrity

- (ii) Select the incorrect statement from the following for a tripeptide. [K2]
  - (a) It has three peptide bonds
  - (b) It has three amino acids
  - (c) It has two peptide bonds
  - (d) It is synthesized in ribosome
- (iii) Point out the type of light which is responsible for the production of active form of phytochrome from inactive form.
  - (a) Blue light
  - (b) UV light
  - (c) Red light
  - (d) Far-red light
- (iv) Choose the level of protein structure that involves the folding of a polypeptide chain into a single unit globular structure.
  - (a) Primary structure
  - (b) Secondary structure
  - (c) Tertiary structure
  - (d) Quaternary structure

2

14 (BOT-2) 2036/G

- (v) Distinguish the post-translational modification of proteins among the following.
  - (a) Folding into secondary structures
  - (b) Removal of introns from mRNA
  - (c) Addition of carbohydrate groups
  - (d) Formation of peptide bonds
  - (vi) Detect the condition from the following which differs among the three types of C4 plants?
    - (a) The enzyme catalyzing the carboxylation reaction in mesophyll cells
    - (b) The enzyme catalyzing the carboxylation reaction in bundle sheath cells
    - (c) Enzyme catalyzing the decarboxylation reaction in bundle sheath cells
    - (d) Chemical nature of C4 compound transported out of mesophyll cells

Contd.

- (vii) Recognize the primary transport form of photo assimilates in plants. [K1]
  - (a) Glucose
  - (b) Sucrose
  - (c) Starch
  - (d) Fructose
- (viii) Indicate among the following which is NOT a naturally occurring auxin. [K2]
  - (a) Indole-3 -acetic acid (IAA)
  - (b) Indole-3-butyric acid (IBA)
  - (c) Naphthaleneacetic acid (NAA)
  - (d) Indole-3-propionic acid (IPA)
- (ix) Interpret among the following to choose the complexes which are parts of alternate pathway of mitochondrial ETS?
  - (a) Complex-I, Complex-II and Complex-III
  - *(b)* Complex-I, Complex-III and Complex-IV
  - (c) Complex-I, and Complex-II
  - (d) Complex-Ill, and Complex-IV

14 (BOT-2) 2036/G

4

- (x) State the false statement about the cell membrane among the following. [Kl]
  - (a) Voltage gradient creates membrane potential
  - (b) Ion channels confer electrical conductance to it
  - (c) It can act as a capacitor
  - (d) It is an absolute insulator
- 2. Discuss the following in short. 3×4=12 [K2]
  - (i) Photorespiration
  - (ii) Reductive amination
  - (iii) Cryptochrome
  - (iv) Lineweaver-Burk equation
- 3. Illustrate the following in details : (any three) 6×3=18 [K4]
  - (i) Significance of imbibitions and osmosis in plants' physiological functions
  - (ii) Initiation and elongation factors and their regulation
  - (iii) Cyanide resistant pathway and its significance
  - (iv) Physiological role of ABA and cytokinin

14 (BOT-2) 2036/G

Contd.

- (v) Mechanism of Auxin transport
- (vi) Mechanisms of action of phytochromes
- 4. Answer *any four* of the following:

10×4=40

- (i) Explain the structure, function and significances of F-types ATPases.
  Illustrate the electrical properties of biological membrane and write how this property is significant for physiological functions. 6+4=10 [K2 + K4]
- (ii) Draw and describe the various levels of protein structure. Discuss the translation process of protein biosynthesis in prokaryotes.

4+6=10 [Kl + K2]

- (iii) Draw and describe the PEPCK type of C4 pathway of  $CO_2$  fixation with its energy balance. Distinguish the anatomical advantages of C4 plants over C3 plants. 6+4=10 [K1 + K2]
- (iv) Outline various mechanisms of posttranslational regulation of enzyme activity.
  10 [K4]

- (v) Critically summarize the EMP pathway and TCA cycle including their significance and energy balance. 5+5=10 K5
- (vi) Describe the gibberellins signalling pathway in plants, starting from the perception of gibberellins by receptors to the activation of downstream responses by including the key components and steps involved in the pathway.
- (vii) Discuss the mechanism of loading and unloading of photoassimilates in plants. Interpret the experimental evidences leading to the knowledge that the translocation of organic solutes takes place through phloem? 5+5=10

7