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End Semester Examination, December 2024

B.Sc. (H.) Agriculture – 1st Semester

FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY (ASAG103)

Time: 2.5 hrs.

Max Marks: 50

Note: *All Questions are compulsory. Marks are indicated against each question.*

PART-A

Q.1 Attempt any 5 questions.

- (a) What is the pH value of pure water? [CO-1] [L-1] 2
(b) Which type of lipids is most commonly found in animal cell membranes? [CO-1] [L-1] 2
(c) Define "embryo rescue" in plant biotechnology. [CO-2] [L-2] 2
(d) The secondary structure of proteins is formed by the folding of polypeptides into alpha-helices and beta-sheets. (True or False) [CO-1] [L-1] 2
(e) The primary structure of proteins is determined by the _____ sequence of amino acids. [CO-1] [L-1] 2
(f) Name the three types of RNA involved in protein synthesis. [CO-1] [L-1] 2
(g) What is the role of *Agrobacterium* in genetic engineering? [CO-2] [L-2] 2

PART-B

Q.2 Discuss the importance and classification of carbohydrates. Explain their reducing and oxidizing properties with suitable examples. [CO-1] [L-2] 10

OR

What is the significance of lipids in the human body? Explain the structure and properties of fatty acids.

[CO-1] [L-2]
10

Q.3 Explain the concept of plant biotechnology. Discuss the applications of micro-propagation and callus culture in plant improvement. [CO-2] [L-3] 10

OR

What is somatic hybridization? Explain its role in crop improvement and its significance in biotechnology.

[CO-2] [L-3]
10

Q.4 Define PCR and explain its underlying principle. What are its applications in molecular biology? Provide a step-by-step flowchart illustrating the stages of PCR, along with the required temperatures, enzymes, and metal ions for each step. [CO-4] [L-3] 10

OR

Explain the steps involved in the PCR process and discuss its importance in genetic research and diagnostics.

[CO-4] [L-3]
10

Q.5 Describe the structure of DNA given by Watson and Crick. Write the differences between A, B, and Z forms of DNA. [CO-1] [L-2] 10

OR

What are the key features of RNA structure? Explain the types of RNA and their roles in protein synthesis.

[CO-1] [L-2] 10

Answer key:

Part-A

(a) What is the pH value of pure water?

Answer: The pH value of pure water is **7**, which is considered neutral.

(b) Which type of lipids is most commonly found in animal cell membranes?

Answer: Phospholipids are the most common type of lipids found in animal cell membranes.

(c) Define "embryo rescue" in plant biotechnology.

Answer: Embryo rescue is a technique used in plant biotechnology to recover and culture embryos from hybrid crosses that would otherwise not survive in the parent species' environment. It is commonly used in interspecific or intergeneric crosses to prevent embryo abortion.

(d) True or False: The secondary structure of proteins is formed by the folding of polypeptides into alpha-helices and beta-sheets.

Answer: True. The secondary structure of proteins involves local folding into alpha-helices and beta-sheets, stabilized by hydrogen bonds.

(e) Fill in the blank: The primary structure of proteins is determined by the _____ sequence of amino acids.

Answer: The primary structure of proteins is determined by the **linear** sequence of amino acids.

(f) Name the three types of RNA involved in protein synthesis.

Answer: The three types of RNA involved in protein synthesis are **mRNA (messenger RNA)**, **tRNA (transfer RNA)**, and **rRNA (ribosomal RNA)**.

(g) What is the role of *Agrobacterium* in genetic engineering?

Answer: ***Agrobacterium*** is a bacterium used in genetic engineering to transfer foreign genes into plant cells. It naturally transfers DNA (T-DNA) from its plasmid into the plant genome, which is harnessed in plant biotechnology for gene transfer.