2017

ZOOLOGY

Paper : 402 C

PROTEINS AND PROTEOMICS

Full Marks: 80

Time: 3 hours

The Figures in the margin indicate full marks for the questions.

1. **Answer the following objective types of questions (any eight)** 1 x 8 = 8

a) For a normal secondary structure of protein which one of the following is CORRECT?

i) ϕ and Ψ angles do not determine the conformation of a polypeptide chain

ii) The rotational angle between C α and C (of COOH group) is known as Ψ angle

iii) Rotation around peptide bond is not possible because of side chain collision

iv) Rotation around peptide bond is not possible because of its partial double bond character

b) The presence of glycine and proline destabilize the α-helix structure because-

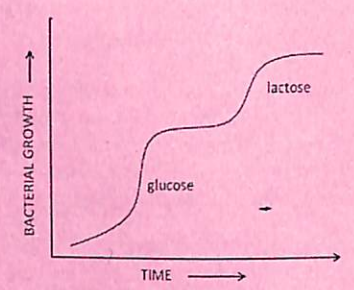
i) They cannot form peptide bonds with neighboring amino acids

ii) Glycine reduces the stability of helix because of its much less restricted conformations

iii) Glycine is highly conformationally restricted residue

iv) The terminal side chain of proline forms bend peptide bond with neighboring amino acid

c) The following graph indicates the growth of E. coli vs. Time in a culture medium containing both glucose and lactose as source of food. Which one of the following is TRUE conclusion from the graph?



i) E. coli grows faster in lactose culture medium

ii) E. coli consume both glucose and lactose simultaneously

iii) E. coli cells prefer to take glucose as food source before they take lactose

iv) None of the above is true

d) What type of point mutation leads to Sickle-cell disease?

i) Frame shift mutation iii) Silent mutation

ii) Nonsense mutation iv) Missense mutation

e) Which one of the following is CORRECT regarding Transposable Elements in Bacteria?

i) IS elements of bacteria is a normal part of bacterial genome

ii) IS elements of bacteria is an extra chromosomal DNA of bacterial

iii) IS elements are autonomous units and codes for the several proteins

iv) IS element ends in short direct terminal repeats

f) Which one of the following is NOT translation termination codon?

i) UAG iii) UGA

ii) AGU iv) UAA

g) LacI gene code for a protein that regulates Lac operon. What will happen to the operon regulation when the LacI gene is mutated in Frame shift manner?

i) Lac operon regulation will not be hampered

ii) The product of mutated LacI gene may inhibit the transcription process

iii) LacI gene will not give any protein

iv) Lac operon will be continuously transcribe

h) Which is INCORRECT statement regarding GU-AG intron splicing mechanism?

i) 5′-splice and 3′-splice sites are also called donor and receptor sites

ii) Initially U1 snRNP protein binds to 3′-branch site

iii) Two transesterification reactions occurs in complete splicing process

iv) Lariat formation occurs after the first transesterification reaction

i) What is an Open Reading Frame?

i) All of the nucleotides of a gene that are transcribed into mRNA

ii) The nucleotides of a gene that make up the codons specifying amino acids

iii) The nucleotides of an mRNA molecule before the introns have been removed

iv) The amino acid sequence of a polypeptide

2. **Answer the following short type of questions (any five)**

2 x 5 = 10

a) What do you mean by loops and folds of a protein structure?

b) Why do you think Lac operon is an inducible gene regulation?

c) What is Shine Dalgerno sequence?

d) What do you mean by catalytic RNA? Give example.

e) How does ethidium bromide act as mutagen?

f) What factors determine a tRNA to bind different amino acids?

3. **Answer the following long type of questions (any four)**

5 x 4 = 20

a) How do polypeptides fold into three-dimensional protein structures?

b) Write short notes on 5'-capping with suitable diagram.

c) Write the significance of promoter, operator and regulatory sequences in gene expression.

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d) Write short notes on any two DNA binding proteins.

e) Write short notes on different types of point mutations.

4. **Answer the following very long type of questions (any two)**

9 x 2 = 18

a) What is a transposable element? Describe the various types of transposable elements and its mechanism of transpositions. (1+8)

b) -What is an Operon concept? How does leader sequence regulate the tryptophan operon? (1+8)

c) What is alternative splicing? Describe the mechanism of nuclear export of mRNA with suitable diagram. (2+7)

5. **Answer the following descriptive type of questions (any two)**

12 x 2 = 24

a) What do you mean by degeneracy of codon? Describe the translation process in prokaryotes. (2+10)

b) Why do you think a gene expression requires regulation? Describe the regulation of gene expression in lambda phage. (2+10)

c) Describe the tertiary and quaternary structure of protein. How do you use Ramachandran plot to study protein folding? Add note on two diseases resulting due to protein misfolding. (3+5+4)

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