BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
First Semester 2016-17
Mid-Term Examination   -   Biological Chemistry (BIO F211)
Closed Book Type

Date: 03/10/2016   Max Duration: 90 min   Max Marks: 50 (25% weightage)
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Note: Do not jumble answers for Part A and Part B

-PART A- [5 marks each in this part]

Q1. What would you predict would happen if the gene for the precursor of rRNA found in *Tetrahymena*, which contains an intron, were introduced into *E. coli* and converted into a primary transcript by the DNA- dependent RNA polymerase of *E. coli*?

Q2. If one carries out the partial mild-acid hydrolysis of glycogen or starch and then isolates from the product oligosaccharides all of the trisaccharides present, how many different kinds of trisaccharides would one expect to find? Disregard alpha –or Beta- anomers.

Q3. Suppose you are studying the conformation of a monomeric protein that has an unusually high proportion of aromatic acid amino acid residues throughout the length of the polypeptide chain. Compared to a protein containing many glycine residues, what would you observe for allowed ranges of phi and psi? What can you say about the relative alpha helical content in each of the two types of proteins?

Q4. Briefly discuss the origin of metabolic reactions giving an example?

Q5. Pyridoxal phosphate or related metabolites are required growth factors for *Lactobacillus* species. For example, when amino acids such as alanine or glutamate are used as sole source of nutrition, these bacilli do not grow nor do they generate metabolic energy unless pyridoxal phosphate or its metabolites are supplied. Explain these observations.

-PART B-

Q6. *The pharmaceutical industry is always interested in searching for novel enzyme inhibitors and determining the kinetics involved.* Analyze this statement briefly with the help of relevant examples.   [4M]

Q7. Examine briefly the physiological significance of 'Michaelis Menten' constant for an enzyme in cellular context.   [4M]

Q8. Suppose an enzyme catalyzes the reaction A $\leftrightarrow$ B. Researchers find that the K_m for the substrate A is 4 μM, and the k_{cat} is 20 min^{-1}. In an experiment, [A] = 6 mM, and the velocity V_0 was 480 nM min^{-1}. What was the [E_t] used in the experiment? Justify/show calculations.   [4M]

Q9. Design an experiment to purify a protein of interest from the cellular extract using salt. Given that the protein's surface is rich in hydrophobic amino acid residues. [4M]

Q10. Given an enzyme, how will you determine if it is a Michaelis-Menten kind of enzyme or an allosteric one? Also, pictorially represent the models for allosteric enzyme behaviour. [4M]

Q11. Suppose in an interview for a project assistant in a laboratory routinely involved in protein purification and characterization, your interviewer asks you to suggest equipments for a new lab they are setting up. Give your answer pointwise, also citing proper justification for suggesting each equipment/instrument. [5M]

-----------------------------ALL THE BEST-----------------------------