

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATIONS-2022

M.Tech. I Semester (BT)

COURSE CODE (CREDITS): 14M11BT215 (3)

MAX. MARKS: 25

COURSE NAME: Metabolic Engineering

COURSE INSTRUCTORS: Jitendraa Vashistt

MAX. TIME: 90 Min

Note: All questions are compulsory. Marks are indicated against each question in brackets.

- Q1.** The major role of Acetyl CoA is associated with the energy production using catabolism in a metabolic pathway. However, if the ratio of ATP/ADP and NADH/NAD⁺ is a high numerical value, then what will be consequences in terms of Acetyl CoA fate? (3 marks)
- Q2.** An enzyme acquired the multi-subunit quaternary structure in which substrate binding with first subunit produces a conformational change in the structure which facilitates the binding of substrate with subsequent subunits. Identify the class of this enzyme and differentiate the enzyme activity in terms of relation of velocity of the reaction vs. substrate concentration for a typical enzyme and this special category of enzyme (3 marks)
- Q3.** "Several peptide antimicrobial molecules may also show the promising effect as an anticancer molecule". a) Is this statement true? If yes, then justify your answer with suitable examples and defines the molecular target for this molecule in a malignant cell. b) Although, peptide antibiotics are synthesized and commercially available, however their usage is restricted to tropical formulations or few oral formulations. What are the limitations associated with these antimicrobials? (2X3=6 marks)
- Q4.** You are working for synthesizing a product from a metabolic pathway and a problem arises that the rate limiting enzyme gets saturated with lower concentrations of substrate. Fortunately, you have another isoforms of the enzymes; Enzyme 'A' which has low Km value and enzyme 'B', which has high Km value. Which of these enzyme isoforms is best suited for generation of metabolite and why? Justify your answer. (3 marks)
- Q5.** Calculate the catalytic efficiency of the enzyme, if the turnover number of enzyme is 30 s⁻¹ and the substrate concentration at half the V_{max} is 0.005 M. (3 marks)
- Q7.** A group of plant origin secondary metabolites with basic heterocyclic nitrogenous structure are synthesized from amino acid derivatives. a) How the amino acids 'Ornithine' and 'arginine' be utilized for synthesis of these nitrogenous compounds? b) Define the medical benefits of the above mentioned metabolites. (3 marks)

P.T.O.

Q8. Lysine is an essential amino acid for humans; however it can be synthesized using the alteration of a metabolic pathway in bacteria. Design an experimental method for production of this essential amino acid using a suitable bacterial host with consideration of auxotrophy and feedback repression. **(4 marks)**

T2 Examinations April 2022