

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATIONS-2023

M.Tech-II Semester (Biotechnology)

COURSE CODE (CREDITS): 14M11BT215 (3)

MAX. MARKS: 35

COURSE NAME: Metabolic Engineering

COURSE INSTRUCTORS: Jitendraa Vashistt

MAX. TIME: 2 Hours

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

- Q1. a)** An enzyme (molecular wt. 24000 Da and concentration of 1mg/ml) is catalyzing a reaction with V_{max} of 0.25 micro moles/minutes in optimum conditions. Calculate the specific activity of this enzyme in terms of units/mg. **(3 marks)**
- b)** Enzymes are usually proteins in nature and the concentration of proteins may be expressed in mg/ml etc. Is it correct to express the concentration of enzyme in the same unit? Justify your answer. Also define the internationally accepted units of enzyme. **(3 marks)**
- Q2.** What are the parameters for controlling the metabolic flux in a metabolic network? Explain how, metabolic flux of metabolite has relation with phenotype and genotype of an organism? Design a metabolic flux analysis flowchart for higher production of specific molecule with suitable example. **(4 marks)**
- Q3.** There are 'stable isotopes' as well as 'radioisotopes' utilized in metabolic engineering. What is the benefit of using a stable isotope over radioisotope in a metabolic labeling experiment? **(5 marks)**
- Q4.** A group of metabolites are present in the colored pigments of flowers and have a characteristic feature of "C6-C3-C6" backbone structure. Identify this group of metabolites and define their biological significance in living organisms. **(5 marks)**
- Q5.** Primary and secondary metabolites are synthesized in plants. However both have distinct functions. What are the relationship and differences between these above metabolites? Also explain their biological significance. **(5 mark)**
- Q6.** "Acetyl COA is a metabolically versatile molecule". Explain the conditions of metabolic pathways in terms of energy state of an organism in which Acetyl COA can proceed to catabolic or biosynthetic phases. **(5 marks)**
- Q7.** A metabolic engineering method may be employed via 'optimizing genetic and regulatory processes' within cells to increase production of a certain substance. Define an experimental design with suitable example by which you can achieve the maximum production of a valuable metabolite in a bacterium cell. **(5 mark)**