JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2025
M.Tech.-II Semester (Biotechnology)

COURSE CODE (CREDITS): **14M11BT215 (3)** MAX. MARKS: **25**
COURSE NAME: **Metabolic Engineering**
COURSE INSTRUCTORS: **Dr. Jitendraa Vashistt** MAX. TIME: **1 Hour 30 Min**

Note: (a) All questions are compulsory. (b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problem.

Q. No.	Question	Marks
Q1	**a)** Define a class of secondary metabolites which are derived from a precursor molecule consisting of a chain of alternating ketone (>C=O, or its reduced forms) and methylene (>CH2) groups: [−C(=O)−CH2−]n. **b)** Also explain how these molecules are associated with primary fatty acid metabolism.	4
Q2	Why cholesterol is considered as amphipathic molecule not hydrophobic? Elucidate the structure of cholesterol which if more hydrophobic than free cholesterol. Also define the role of Acetyl COA in cholesterol biosynthesis.	4
Q3	Explain the significance of the shikimate pathway in plants and microorganisms, focusing on its role in the biosynthesis of aromatic compounds. Discuss how the inhibition of this pathway by herbicides like glyphosate impacts plant metabolism.	4
Q4	Describe the relationship between activation energy and Gibbs free energy in the context of chemical reactions. How do enzymes influence activation energy without affecting ΔG? Use an example to illustrate how this principle facilitates biochemical reactions in living organisms.	4
Q5	How do you differentiate between the following? a) Lignin and lignin b) Competitive and non-competitive enzyme inhibition.	4
Q6	An enzymatic reaction had shown a maximum reaction velocity (V_{max}) of 600 µmol/min, and the Michaelis-Menten constant (K_m) was estimated 50 mM. If the substrate concentration ([S]) is 10 mM, calculate the reaction velocity (V).	5