JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

Ph.D.-I Semester (BT/BI)

COURSE CODE (CREDITS): 24 P1WBT231 (2) MAX. MARKS: 35

COURSE NAME: Biochemical Calculations

COURSE INSTRUCTORS: Dr. Poonam Sharma MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems. Calculators are allowed.

Q.No	Question	Marks
Q1(a)	Calculate the Degree of reduction for $CH_{1.77}O_{0.49}N_{0.24}$	3
(b)	Tyndall effect is quite strong in lyophobic colloids while in lyophilic colloids it is weak. Explain	3
Q2(a)	Acetobacter aceti bacteria convert ethanol to acetic acid under aerobic conditions as shown below. A continuous fermentation process for vinegar production is proposed using non-viable A. aceti cells immobilised on the surface of gelatin beads. The production target is 2 Kg h^{-1} acetic acid, however the maximum acetic acid concentration tolerated by the cells is 12 %. Air is pumped into the fermenter at a rate of 200 gmol h^{-1}. Draw the mass balance table and calculate components of air	4
(b)	Differentiate between reaction kinetics and reaction thermodynamics	3
Q3(a)	Explain the role of energy in exergonic reactions and endergonic reactions with the help of energy level diagram.	3
(b)	Production of protein having composition ($CH_{1.55}O_{0.31}N_{0.25}$) by a genetically strain *E. Coli* ($CH_{1.77}O_{0.49}N_{0.24}$) is proportional to cell growth. Ammonia is used as nitrogen source for aerobic respiration of glucose. The yield of biomass from glucose is measured as 0.48gg^{-1} and the yield of protein is 20% of biomass. (i) How much ammonia is required? (ii) What is the oxygen demand? (ii) If the biomass yield remains same, how much ammonia and oxygen requirements differs if biomass is unable to synthesize protein	5
Q4(a)	Differentiate between theoretical yield and observed yield	3
(b)	The kinetics of many biological reactions are either zero-order, first-order and a combination of Michaelis-Menten kinetics. Justify	4
Q5(a)	Convert 0.277 kg of O_2 into kgmol	3
(b)	Explain mass balance equations and steps for the calculations	4