

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

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

COURSE CODE (CREDITS): 24 P1 WBT231 (2)

MAX. MARKS: 35

COURSE NAME: Biochemical Calculations

COURSE INSTRUCTORS: Dr. Poonam Sharma

MAX. TIME: 2 Hour

Note: (a) All questions are compulsory.

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

Q.No	Question	Marks
Q1(a)	Write the different mass balance equations	2
(b)	What is standardization? Give difference between primary standard and secondary standard.	4
Q2(a)	How enthalpy and entropy are related?	2
(b)	Define the following terms: (i) Mole fraction (ii) Molality (iii) Molarity (iv) Mass percentage	4
Q3	Corn steep liquor (125 kg) contains 2.5% invert sugars and 50% water; rest can be considered as solids. Beet molasses (45 kg) containing 50% sucrose, 1% invert sugars, 18% water and the remainder solids. Both mixtures mixed together in mixing tank. Water is also added as separate component. Final product containing 2% invert sugars as one component is obtained. Draw the flow sheet and mass balance table only	7
Q4	<i>Candida utilis</i> cells convert glucose to CO ₂ and H ₂ O during growth. The cell composition is CH _{1.84} O _{0.55} N _{0.2} plus 5% ash. Yield of biomass from substrate is 0.5 g g ⁻¹ . Ammonia is used as nitrogen source. (i) What is the oxygen demand? (ii) <i>C. utilis</i> is also able to grow with ethanol as substrate, producing cells of the same composition as above. On a mass basis, how does the maximum possible biomass yield from ethanol compare with the maximum possible yield from glucose?	8
Q5	Absolute or 100% ethanol is produced from a mixture of 95% ethanol and 5% water using the Keyes distillation process. A third component, benzene, is added to lower the volatility of the alcohol. Under these conditions, the overhead product is a constant-boiling mixture of 18.5% ethanol, 7.4% H ₂ O and 74.1% benzene. Use the following data to calculate the volume of benzene which should be fed to the still in order to produce 250 litres of Absolute ethanol: (density 100% alcohol = 0.785 g cm ⁻³) ; (density benzene = 0.872 g cm ⁻³).	8