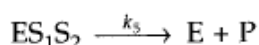
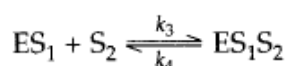
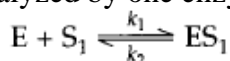


**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-VI EXAMINATION – WINTER 2025****Subject Code:3160512****Date:25-11-2025****Subject Name:Biochemical Engineering****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

**MARKS**

- Q.1** (a) State the function of following in Eukaryotic cell: **03**
1. Golgi bodies
  2. endoplasmic reticulum
  3. Chloroplasts
- (b) Justify the following statement: **04**
- ‘Agitator is important component for fermenter design’.
- Write the flow pattern for the following agitator:
1. Disc turbine
  2. Pitched blade agitator
- (c) Explain the biological process with a suitable block diagram. State the merit and demerit of biological process. **07**
- Q.2** (a) Differentiate between Monosaccharides and Polysaccharides. **03**
- (b) Specify building blocks and bond formation for the following: **04**
- (1) Protein, (2) Disaccharides, (3) Fat, and (4) Nucleotide.
- (c) Define the quaternary structure of protein? Classify the following protein based on their structure: **07**
1. Insulin
  2. Hemoglobin
  3. Glycine
  4. Fibrous protein
- Discuss the three important characteristics of protein.
- OR**
- (c) Discuss in brief about property of lipid, its variant and application. **07**
- Q.3** (a) What is enzyme inhibition? List out the various type of enzyme inhabitation. **03**
- (b) List out the unit operations involved for separation of products based on the following criteria **04**
1. Size
  2. Solubility
  3. Diffusivity
  4. Vapour pressure
- (c) Following sequence describes the reactions of two different substrates catalyzed by one enzyme: **07**



- a. Derive the rate equation by making the Michaelis-Menten assumption.
- b. What is the rate equation if the concentration of  $S_1$  is much higher than that of  $S_2$ ?

**OR**

- Q.3** (a) State the important points in designing and constructing a fermenter. **03**
- (b) Discuss the following plots for estimation of kinetic parameters: **04**
1. Langmuir plot
  2. Line weaver-Burk plot
- (c) What is Enzyme immobilization? List out the methods used for enzyme immobilization. Explain the merit of enzyme immobilization over suspended cultures. **07**
- Q.4** (a) Define the following: **03**
- (1) Sterilization (2) Foaming in reactor (3) oxygen uptake rate
- (b) State the mechanism and application of following chromatography: **04**
1. Adsorption chromatography
  2. Gel-filtration chromatography
- (c) The following data were obtained from enzymatic oxidation of phenol by phenol oxidase at different phenol concentrations. **07**

S (mg/l)	10	20	30	50	60	80	90	110	130	140	150
v (mg/l-h)	5	7.5	10	12.5	13.7	15	15	12.5	9.5	7.5	5.7

- a. What type of inhibition is this?
- b. Determine the constants  $V_m$  and  $K_m$ .
- c. Determine the oxidation rate at  $[S] = 70$  mg/l.

**OR**

- Q.4** (a) What is isoelectric focusing? State the mechanism and use of isoelectric focusing in biochemical processing. **03**
- (b) Briefly Discuss the following: **04**
- (1) cell death kinetics
  - (2) Monod Equation
- (c) Aerobic degradation of an organic compound by a mixed culture of organisms in waste water can be represented by the following reaction. **07**
- $$C_3H_6O_3 + aO_2 + bNH_3 \rightarrow cC_5H_7NO_2 + dH_2O + eCO_2$$
- a. Determine a, b, c, d, and e, if  $Y_{X/S} = 0.4$  g X/g S.
  - b. Determine the yield coefficients  $Y_{X/O_2}$  and  $Y_{X/NH_3}$ .
  - c. Determine RQ (Respiratory Quotient) for the organisms.
- Q.5** (a) List the methods available for product recovery. How cell disruption is useful in biochemical processes? **03**
- (b) What is volumetric oxygen transfer coefficient? State the factor affecting it. **04**
- (c) Discuss the plug flow reactor for biomass processing with a suitable diagram. **07**

**OR**

- Q.5** (a) Differentiate between chemostat and turbidostat for biological process. **03**
- (b) State the unique features of batch and continuous biomass culture. **04**
- (c) Discuss the continuous stirred tank reactor biomass using a suitable diagram. **07**

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