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53 (FPT 711) INMB

2019

**INDUSTRIAL MICROBIOLOGY AND  
ENZYME TECHNOLOGY**

Paper : FPT 711

Full Marks : 100

Time : Three hours



***The figures in the margin indicate  
full marks for the questions.***

***Answer any five questions.***

1. (a) How inoculum is developed in the fermentation industry? Give one example of anaerobic fermentation technique. Why sterile air supply is necessary in an aerobic fermentation process? Differentiate between Primary and Secondary Metabolites.

3+3+2+2=10

Contd.

(b) Describe the basis of selection of microorganisms in fermentation industries. Give the name of citric acid producing organism. How citric acid is recovered from fermented liquor? Why Submerged culture production of citric acid is different from Surface culture production? 3+1+4+2=10

2. (a) What do you understand by LAB? Cite two examples of LAB forming lactic acid as the major product from lactose. Mention two different forms of lactic acid with structures. Give only the purification steps of crude lactic acid in fermentation broth. 1+2+4+3=10

(b) What is Vinegar? Give the name of the vinegar producing organism. Cite two examples of important enzymes during vinegar fermentation. How Fumaric acid is recovered from fermentation broth? 1+2+2+5=10

3. (a) Give the structure of Itaconic acid. What is its correlation with Krebs cycle? Mention the name of Itaconic acid producer. Describe the fermentative production and purification of Itaconic acid. 1+2+1+6=10

(b) How Glucose is converted to Gluconic acid? Give the structure of Gluconic acid. How pure Gluconic acid is obtained from fermentation broth? Differentiate between microbial lipid and lipid with examples. 2+2+4+2=10

4. (a) What is Antibiotic? Classify narrow and broad spectrum antibiotic with examples. Write down the structure of Pen-G. How Pen-G is recovered? How unit of penicillin is expressed? 1+2+2+4+1=10

(b) What is Semi-synthetic Penicillin? What is 6-APA? How is it produced from Pen-G? Describe the production of a Semi-synthetic Penicillin. What is Penicilloic acid? 1+2+2+4+1=10

5. (a) Differentiate between Surface culture and Submerged culture fermentation technique. What is Koji? How is it prepared? 4+1+5=10

(b) Discuss isolation and recovery of Alpha-amylase from fermentation broth. What is its action upon starch and what type of enzyme is it? Which are the required substrates for cellulase and pectinase and what are their degraded products? 4+2+4+4=10



6. (a) Draw a neat sketch of Continuous Stirred-Tank Fermenter (CSTF). The diameter of a fermenter is  $2m$ . Calculate the height and volume of the fermenter if it is cylindrical in shape. Also calculate the working volume of the fermenter by considering standard design criteria.  $5+1+2+2=10$

(b) Describe the role of enzymes in food processing. How protein extraction and purification are carried out? What is characterization of protein?  $5+4+1=10$

7. (a) Define Enzyme Immobilization process. Why support/carrier materials are so important for enzyme immobilization? Give few examples of synthetic support materials for this purpose. Give the chemical methods of enzyme immobilization.  $1+2+2+5=10$

(b) Give *three* potential applications of Enzyme Immobilization Technology in industry. Give some examples of enzymes for clinical purpose. Describe briefly the process of synthesis of microbial polysaccharide.  $3+3+4=10$

