Total number of printed pages–6

53 (FPT 711) IMET

2021

(Held in 2022)

INDUSTRIAL MICROBIOLOGY & 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 :* 20×5=100

1. *(a)* Describe the layout of fermentation technology with the importance of the inoculum development path and air sterilization process. Explain downstream processing in fermentative production. What are the different process parameters measured and controlled in the fermentation process ? Cite one example of each aerobic and anaerobic fermentation process.

4+2+2+2

Contd.

(b) Give one example of each of the different LAB. Mention the biochemical reactions involved during the action of different LAB on milk sugar. Discuss the purification process of lactic acid production. Mention different grades of lactic acid. 2+3+3+2

2. (a) Give the structure of citric acid and its equivalent weight. Mention the name of the producer organism. How can citric acid be produced by surface culture technique ? Describe the recovery of citric acid from fermentation broth. 2+1+3+4

(b) What is vinegar ? Mention the name of vinegar producing organism. Briefly discuss the biochemical reactions involved during vinegar fermentation with the influence of enzymes. Describe the fermentative production and purification of gluconic acid. 1+1+3+5

3. *(a)* Give the chemical structure of fumaric acid. Mention the isomeric form of fumaric acid with its structure. Briefly describe the medium composition and fermentation conditions during the production of fumaric acid. Explain the recovery of fumaric acid from fermentation broth. 1+1+4+4

(b) Mention the name, type of producer organism, involvement of enzyme and fermentation conditions during itaconic acid production. Describe the isolation and recovery of itaconic acid from fermented liquor. 1+1+1+2+5

4. *(a)* How are antibiotics classified on the basis of activity against microorganisms ? Give *one* example of each. What do you understand by 1 *lac* unit of penicillin-G ? Describe the mechanism of action of antibiotics against human pathogens. 1+1+2+6

(b) Give the structure of Pen-G. Explain with a flow diagram, the fermentative production and purification of Benzylpenicillin (Pen-G). Differentiate between penicillin and semisynthetic penicillin with examples. 2+6+2

5. *(a)* Give the action of a gram (-) *ve* bacteria and alkali on benzylpenicillin. How is streptomycin recovered from fermentation broth ? Give the name and character of the streptomycin producer. 2+6+2

(b) What is kōji ? How is it prepared ? Discuss the isolation and recovery of alpha amylase from fermentation broth. Differentiate between three amylases on the basis of mode of action on the starch molecule. 1+2+4+3

6. *(a)* Draw a neat sketch of CstF with its component parts. Briefly mention the standard geometrical ratios of a fermenter besides its design.

A bioreactor is considered cylindrical in shape. The diameter of the bioreactor is given as 3 *ft.* (Assume height : diameter = 3 : 1.

Now under standard conditions, calculate the following :

(i) Height of the bioreactor

(ii) Working volume of the bioreactor

(iii) Impeller diameter, width and length

(iv) Liquid depth

(All calculations should be considered in SI units). 3+2+5

(b) Discuss the functions of agitator, aerator and antifoam. Differentiate between batch, fed-batch and continuous fermentation. Describe the airlift fermenter with a suitable figure. 3+3+4

7. (a) What do you understand by the term immobilization of enzyme ? Cite *two* examples each of natural and synthetic support materials. Explain *four* important characteristics of carrier/matrix material. Give *two* therapeutic applications of an enzyme. 2+2+4+2

(b) Describe physical and chemical enzyme immobilization methods with the schematic diagram. Explain CLEA technology with a suitable example. Give *two* potential applications of immobilized enzyme technology in the industry. 5+3+2

8. (a) Differentiate between nucleotide and nucleoside with respect to DNA. Explain r-DNA technology with a suitable diagram. Cite *two* potential applications. 2+6+2

(b) Differentiate between codon and anticodon. Mention some stop codons. Explain inducible and repressible protein control synthesis. 2+2+6

9. (a) Define isoelectric point(pI). Explain protein isolation and purification technique with suitable methods. 2+8

(b) Briefly describe *one* advanced protein characterization technique. Explain proteomics. What is biosurfactant? 6+3+1
