

**INDUSTRIAL MICROBIOLOGY & ENZYME TECHNOLOGY
(BIOT 2204)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Xanthan is produced by
(a) analogue resistant mutant (b) auxotrophic mutant
(c) fed batch fermentation (d) none of these.
- (ii) Feedback repression is eliminated by
(a) analogue resistant mutant (b) auxotrophic mutant
(c) fed batch fermentation (d) none of these.
- (iii) Biotin is not essential for industrial production of
(a) Gluconic acid (b) Vitamins
(c) Amino acids (d) Exopolysaccharides.
- (iv) Microbial heteropolysaccharide is
(a) Glucan (b) Xanthan
(c) Acetic acid (d) Gluconic acid.
- (v) Bradford reagent is used for determination of
(a) total carbohydrate (b) reducing sugar
(c) total protein (d) none of these.
- (vi) Role of papain is essential for production of
(a) Beer (b) Gluconic acid
(c) Wine (d) None of these.
- (vii) Hexokinase enzyme is under the group of
(a) Transferase (b) Lyase
(c) Ligase (d) None of these.
- (viii) Biosensor which detects the change in current is known as
(a) Piezo-electric biosensor (b) Calorimetric biosensor
(c) Amperometric biosensor (d) Potentiometric biosensor.

- (ix) Which of the following is not a Bio-recognition element?
(a) Enzymes (b) Microbes
(c) Plant Tissues (d) Thermistors.
- (x) Which of the following reactor does not allow the control of temperature?
(a) Packed Bed Reactor (b) CSTR
(c) Bubble Column Reactor (d) None of the above.

Group- B

2. (a) Illustrate schematically the xanthan production process. *[[CO1] (Illustrate/HOCQ)]*
(b) How citric acid is recovered ? *[[CO2] (Understand/IOCQ)]*
(c) Analyze catabolite repression process. *[[CO1](Analyze/IOCQ)]*
6 + 4 + 2 = 12
3. (a) Mention any two suitable carbon sources with proper function. *[[CO2] (Remember/LOCQ)]*
(b) Discuss briefly the incomplete oxidation process. *[[CO2] (Discuss/HOCQ)]*
(c) Analyze the role of bromouracil. *[[CO1](Analyze/IOCQ)]*
4 + 6 + 2 = 12

Group - C

4. (a) Mention the role of steam in bioreactor. *[[CO3] (Describe/HOCQ)]*
(b) What is bioconversion? Give suitable example. *[[CO2] (Analyze/IOCQ)]*
(c) Discuss the role of hop. *[[CO2](Analyze/IOCQ)]*
5 + 5 + 2 = 12
5. (a) Comment on the role of protoplast fusion technique. *[[CO3] (Comment/IOCQ)]*
(b) Discuss the role of biotin in glutamic acid production. *[[CO3] (Discuss/IOCQ)]*
(c) Discuss the role of borate in gluconic acid production. *[[CO2](Analyze/IOCQ)]*
5 + 5 + 2 = 12

Group - D

6. (a) Illustrate the process of immobilizing enzymes by adsorption method. Write it's advantages and limitations. *[[CO1] (Illustrate, / IOCQ)]*
(b) Describe the working principle of Packed Bed Reactor as reactor of immobilized enzymes. *[[CO1] (Describe/HOCQ)]*
(3 + 4) + 5 = 12
7. (a) Briefly discuss the extremophilic enzymes. *[[CO3] (Discuss/IOCQ)]*
(b) Mention the significance of total activity and specific activity. *[[CO4] (Understand/LOCQ)]*
(c) Classify enzymes on the basis of mode of action. *[[CO3](Analyze/IOCQ)]*
4 + 4 + 4 = 12

Group - E

8. (a) How specific activity of enzyme can be checked ? [[CO4] (Remember/LOCQ)]
 (b) Compare between the mode of action of lyase and ligase. [[CO3] (Compare/IOCQ)]
 (c) Mention how blood triglyceride level is estimated? [[CO4](Analyse/IOCQ)]
4 + 5 + 3 = 12
9. (a) Discuss the working principle of an optical biosensor. [[CO5](Discuss/IOCQ)]
 (b) Enumerate the role of a biosensor in a defence sector. [[CO5] (Enumerate/HOCQ)]
6 + 6 = 12
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<i>Cognition Level</i>	<i>LOCQ</i>	<i>IOCQ</i>	<i>HOCQ</i>
<i>Percentage distribution</i>	<i>12.5</i>	<i>58.33</i>	<i>29.16</i>

Course Outcome (CO):

After completing this course, students will be able to:

1. Describe different methods for immobilization of enzymes.
2. Apply enzymes in various industries that can benefit human life
3. Produce different useful secondary metabolites by microbes.
4. Modify the enzymes for better stability.
5. Design different biosensors for applications in biotechnology.
6. Develop the fermentation techniques and downstream processes.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*

