Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/BT(OLD)/SEM-4/BT-402/2013

2013

INDUSTRIAL MICROBIOLOGY & ENZYME TECHNOLOGY

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

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

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Enzyme used in detergent is
      a) α -amylase b) glucose isomerase
      c) alkaline protease d) none of these.

   ii) Renin is used in
      a) Baking industry b) Textile industry
      c) Dairy industry d) Brewing industry.

   iii) The equation of motion of Newtonian fluid is known as
      a) Arrhenius equation
      b) Avogadro's equation
      c) Navier-Stoke's equation
      d) Momentum transfer.

   iv) The moisture level of SSF is
      a) 30% ± 5% b) 42% ± 5%
      c) 40% ± 5% d) 45% ± 5%.

v) Citric acid is produced by
   a) *Aspergillus niger*
   b) *Candida utilis*
   c) *Trichoderma utilis*
   d) *Saccharomyces serevisiaa.*

vi) The Koji process is
   a) Aerobic process b) Anaerobic process
   c) Submerged process d) Steady-state process.

vii) Lyophilisation is the storage of commercial strain through
   a) Sporulation
   b) Freeze drying
   c) Boiling and subsequent condensation
   d) Vegetative reproduction.

viii) Commercial Streptomycin production is carried out by using
   a) S. Aureus b) S. Griseus
   c) S. Pyogenes d) Streptococcus.

ix) The cutting site for α-amylase on the starch is
   a) α-1, 4 glycosidic bond
   b) Amide bond
   c) Diester bond
   d) none of these.

x) Lipase splits fats into
   a) Glucose + Fructose b) Glycerol + Glucose
   c) Glucose + Galactose d) Glycerol + Fatty acids.

xi) Xanthan can be obtained by microbial fermentation as
   a) a primary metabolite b) extracellular enzyme
   c) secondary metabolite d) intracellular enzyme.

xii) Rheological behaviour of concentrated cell suspensions is given by the type of non-Newtonian fluids of the type
a) Bingham plastic b) Dilatant
c) Pseudoplastic d) Thixotrophy.

xiii) Taq polymerase is isolated from
a) *Bacillus licheniformis* b) *Thermus aquaticus*
c) *Mucor micheli* d) *E. coli.*

xiv) The enzyme administered to stop bleeding is
a) papain b) β-galactosidase
c) lipase d) thrombin.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Distinguish between primary and secondary metabolites. Cite two examples of each of them. 3 + 2
3. Write a note on Enhancement of Enzyme stability.
4. Write a note on site-directed mutagenesis in protein/enzyme engineering.
5. Write a note on industrial application of enzymes.
6. Describe the production of citric acid.
7. Write a note on Navier-Stokes equation and its application.
8. What is Xanthan ? How is it produced by fermentation ?

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

9. What are the β-lactan antibiotics ? Describe the Penicillin production with schematic representation. 3 + 12
10. What are amylase enzymes ? How many types of amylase enzymes are there ? Describe the fermentation process for the production of α-amylase. 2 + 3 + 10
11. What are the differences between submerged fermentation and solid state fermentation ? Describe the solid state fermentation process with diagram. What are the advantages of solid state fermentation ? 2 + 10 + 3

12. What is $K_L a$? How many types of $K_L a$ measurement methods are there ? Describe the dynamic method for the measurement of $K_L a$. 2 + 3 + 10

13. A 20L stirred fermenter containing a Bacillus strain cluster at 30°C is used for production of microbial insecticide. $K_L a$ is determined using the dynamic method. Air flow is shut off for a few minutes and the dissolved O_2 level drops; the air supply is then re-connected. When steady state is established, the dissolved-O_2 tension is 78% air saturation. The following results are obtained :

Time(s)	5	15
O_2 tension (% air saturation)	50	66

a) Estimate $K_L a$.

b) An error is made in determining the steady state O_2 level which, instead of 78% is taken as 70%. What is the percentage error in $K_L a$ resulting from this 10% error in C_{AL} ? 10 + 5

14. What is enzyme immobilization ? What are the advantages of enzyme immobilization ? Explain in brief the various methods of enzyme immobilization. 2 + 4 + 9

15. What is protoplast ? Describe the protoplast fusion technique. How is this technique useful ? Briefly describe how the hybrids and cybrids are produced through protoplast fusion. 2 + 7 + 2 + 4

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