



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)

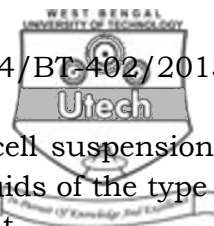
1. Choose the correct alternatives for any *ten* of the following :

10 × 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% \pm 5%
 - b) 42% \pm 5%
 - c) 40% \pm 5%
 - d) 45% \pm 5%.



- v) Citric acid is produced by
- a) *Aspergillus niger*
 - b) *Candida utilis*
 - c) *Trichoderma utilis*
 - d) *Saccharomyces cerevisiae*.
- 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. $3 \times 5 = 15$

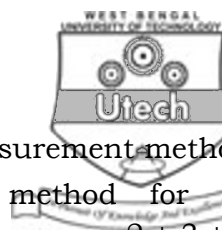
2. Distinguish between primary and secondary metabolites. Cite two examples of each of them. $3 + 2$
3. Write a note on Enhancement of Enzyme stability.
4. Write a note on site-directed mutagenesis in protein/enzyme engineering.
5. Write a note on industrial application of enzymes.
6. Describe the production 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. $3 \times 15 = 45$

9. What are the β -lactam 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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