



Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(BT)/SEM-4/BT-402/2011
2011**

**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) Which of the following may cause changes in the number of chromosome ?
- a) Chromosome mutation
 - b) Genome mutation
 - c) Point mutation
 - d) Transitions.
- ii) Bingham plastic fluids are described by
- a) $\tau g_c = \mu \left(\frac{du}{dy} \right)$
 - b) $\tau g_c = \tau_o g_c + k \left(\frac{du}{dy} \right)$
 - c) $\tau g_c = k' \left(\frac{du}{dy} \right)^n$
 - d) none of these.



- iii) The mathematical formation for the law of conservation of mass is designated as
- a) Energy equation b) Arrhenius equation
c) Continuity equation d) Momentum theorem.
- iv) Xanthan is an example of
- a) primary metabolite b) secondary metabolite
c) intracellular enzyme d) extracellular enzyme.
- v) Tetracycline is
- a) broad spectrum antibiotic
b) narrow spectrum antibiotic
c) both (a) and (b)
d) none of these.
- vi) Fleming's penicillin was
- a) Penicillin G
b) Penicillin F
c) Penicillin V
d) 6-Aminopenicillanic acid.
- vii) The predominant glycosidic linkage in dextran is
- a) $\alpha (1 - 4)$ b) $\alpha (1 - 6)$
c) $\beta (1 - 4)$ d) $\beta (1 - 6)$.
- viii) Stability of enzyme activity means preservation of its
- a) structure b) activity
c) pH d) none of these.
- ix) Alkaline protease is produced by
- a) batch culture
b) continuous culture
c) solid state fermentation
d) fed-batch culture.



- x) Biopol is composed of
- Polyhydroxyoctanoate
 - Polyhydroxybutyrate
 - Polyhydroxyvalerate
 - Poly (3-hydroxybutyrate-co-3-hydroxyvalerate)
- xi) Lyophilization is the storage of commercial strain through
- sporulation
 - freeze-drying
 - mixing with soil
 - boiling and condensation.
- xii) Riboflavin is commercially synthesized by
- ashbya gossypii*
 - Pseudomonas ovalis*
 - Bacillus subtilis*
 - Klebsiella* sp.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- What do you mean by submerged and solid state fermentation ? Briefly state the merits and demerits of solid state fermentation.
- Derive the equation of continuity.
- What do you mean by enzyme stability ? What are the different methods available to engineer a protein ? What are the different invitro methods available to attempt make a more stable enzyme. $1 + 1 + 3$
- E.coli* have a maximum respiration rate, $q_{O_2 \max}$, of about $240 \text{ mg } O_2 / gX.h$. It is desired to achieve a cell mass of 20 g/l . The $K_L a$ is $120/h$ in an 800l reactor. A gas stream enriched in oxygen is used which gives a value of $C^* = 28 \text{ mg/l}$. If oxygen becomes limiting and q_{O_2} follows Monod kinetics with respect to C_L with a saturation constant value of 0.2 mg/l , where C_L is the dissolved oxygen concentration in the fermentor. What is the C_L when cell mass is 20 g/l ?
- Describe Navier-Stokes equation and its application.



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. What is $K_L a$? How many types of $K_L a$ measurement methods are there ? Describe the dynamic method for the measurement of $K_L a$. $2 + 3 + 10$
8. What are base analogs ? Describe a method by which induced mutation can be achieved for the improvement of microbial strains. $4 + 11$
9. Define immobilization of enzymes. How many types of carriers are being used to immobilize enzyme ? Give some examples of enzyme application in medical and industrial field. What are the different merits of immobilized enzyme over soluble enzyme for use in bioprocess ? $2 + 4 + 4 + 5$
10. Write briefly about any *three* of the following : $3 \times 5 = 15$
- a) Heterogeneous versus diffusion chemical reaction
 - b) Application of heat transfer to bioreactor system
 - c) Half-life method
 - d) Transition versus transversion.
11. What are β lactam antibiotics ? Write briefly the process of industrial production of tetracycline with particular reference about microbial strain, inoculum preparation, production medium, fermentation parameters, fermentation process, recovery and yield. $1 + 1 + 2\frac{1}{2} + 2\frac{1}{2} + 2 + 3 + 2 + 1$