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HERITAGE INSTITUTE OF TECHNOLOGY

M. Tech/1st year/1st Semester Examination. 2014 Session : 2014-2015

Discipline : Biotechnology

Paper Code : BIOT 5102 Paper Name: Advanced Enzyme Technology

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 x 1=10

(i) Competitive inhibition of an enzyme affects:
- (a) Acitve site
- (b) Allosteric site
- (c) Enzyme-substrate complex
- (d) All of the above

(ii) Purification of an enzyme is monitored by:
- (a) Units recovered
- (b) Specific activity
- (c) Protein recovered
- (d) All of these

(iii) Urea is a good:
- (a) Kosmotropic ion
- (b) Good chaotropic ion
- (c) Enzyme inhibitor
- (d) Allosteric activator

(iv) Void volume of a gel is determined by:
- (a)Serum albumin
- (b) Haemoglobin
- (c) Blue dextran
- (d) None

(v) Protein is best precipitated at pH:
- (a) Slightly acidic
- (b) Slightly alkaline
- (c) Near isoelectric pH
- (d) Above the isoelectric point

(vi) Lignin mainly consists of:
- (a) Aromatic alcohol
- (b) Aliphatic alcohol
- (c) Aromatic hydrocarbon
- (d) Aliphatic hydrocarbon

(vii) The enzyme used to treat gout is:
- (a) Asparaginase
- (b) Uricase
- (c) Collagenase
- (d) None

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(viii) The enzyme that can potentially be used as an antibacterial agent is:

(a) Insulin (b) lysozyme

(c) β-lactamase (d) Ribonuclease

(ix) Alkaline protease is mainly used in:

(a) Detergent industry (b) Textile industry

(c) Dairy industry (d) None of these

(x) Raffinose is:

(a) Monosaccharide (b) Disaccharide

(c) Trisaccharide (d) None of these

Group - B

2. (a) Write the equation for the velocity of sedimentation of solid from liquid phase in a centrifuge with explanation of all terms.

(b) What is sigma factor of a centrifuge?

(c) Explain in brief different types of large scale centrifuge used for downstream processing of microbial enzymes. 4+2+6=12

3. (a) Explain diagrammatically how the rate of an enzymatic reaction varies with the change of substrate concentration.

(b) How K_m is related to rates of forward and backward reactions?

(c) What is V_{max}? What is the significance of K_m and V_{max} values of an enzyme to be useful for industrial application and how these values are determined? 4+3+5=12

Group - C

4. (a) What is salting out of proteins?

(b) How do high molecular weight proteins remain soluble in aqueous phase?

(c) What is Hofmeister Seies?

(d) What are kosmotrophic and chaotropic ions?

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(e) Why is ammonium sulphate a preferred salt for protein precipitation?

(f) What is the principle of hydrophobic chromatography and how is it done? 2+1+1+1+2+5 = 12

5. (a) Describe principles of Ion-Exchange and Affinity chromatography.

(b) Explain the different types of matrix used for both types of chromatography. 6+6 = 12

Group - D

6. (a) What is the difference between biopulping and biopolishing?

(b) How is penicillin acylase enzyme immobilized?

(c) What is the function of penicillin acylase? 6+4+2 = 12

7. (a) What is HFCS?

(b) How is it prepared?

(c) What is lactose intolerance?

(d) Briefly describe the use of different enzymes in detergent industry. 2+3+2+5=12

Group - E

8. What are biosensors? What are its different types? Describe the functions of different biosensors. (3+3+6) = 12

9. (a) Define artificial enzyme.

(b) Explain how enzymes can be used in the treatment of cancer.

(c) Describe how protein engineering can be used in enzyme technology. 2+4+6 = 12