Printed Page:- 04 Subject Code:- ABT0502

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2024 - 2025)

Subject: Bioprocess Engineering

Time: 3 Hours Max. Marks: 100

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A 20

1. Attempt all parts:-

1-a. What is true about aerobic bacteria? (CO1, K1) 1

(a) fluorish in the presence of free oxygen

(b) consume organic matter as their food

(c) oxidise organic matter in sewage

(d) All of the above

1-b. The organic material of the solid waste will decompose (CO1, K1) 1

(a) By the flow of water

(b) By the soil particles

(c) By the action of microorganisms

(d) By oxidation

1-c. Which of the following is incorrect for a catalyst? (CO2, K2) 1

(a) Bio-chemical reactions are mostly catalyzed by enzymes

(b) Catalyst does not start a reaction

(c) Catalyst changes the equilibrium constant of a reaction

(d) Co-enzymes increase the activity of an enzyme

1-d. Which of the following is INCORRECT for the lock-and-key model? (CO2, K1) 1

(a) It is used to describe the binding process

(b) The active site of the enzyme is complementary to the substrate

(c) It demonstrates enzyme-substrate complex

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(d) The binding of the substrate produces a conformational change in enzyme

1-e. From the following volumes, which capacity the Pilot-scale bioreactor holds? (CO3, K1) 1

(a) 100-1000L
(b) 1000-10000L
(c) 1-100L
(d) less than 1L

1-f. Which of the following physicochemical factor does not affect SSF? (CO3, K1) 1

(a) Pressure
(b) Temperature
(c) pH
(d) Moisture content

1-g. The production of bio ethanol is by fermenting the _____ and starch components. (CO4, K1) 1

(a) Acid
(b) Milk
(c) Sugar
(d) Alcohol

1-h. To make transport fuel the bio ethanol is blended with _____ (CO4, K2) 1

(a) Diesel
(b) Petrol
(c) oil
(d) kerosene

1-i. To maintain aseptic conditions during fermentation which of the following is needed? (CO5, K2) 1

(a) Sterilization of fermentor
(b) Sterilization of air supply
(c) Aeration and agitation
(d) All of these

1-j. Nonionizing radiation and ionizing radiation are sterilization methods mainly used in hospitals. Ultraviolet radiation is one example of nonionizing radiation, name the ionizing radiation? (CO5, K2) 1

(a) Infrared
(b) X-rays and gamma rays
(c) Halogens
(d) Ethylene oxide

2. Attempt all parts:-

2.a. What is the major difference between nephelometry and turbidimetry? (CO1, K2) 2

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2.b.	How enzyme catalyze the biochemical reaction? (CO2, K2)	2
2.c.	Write any four applications of solid-state fermentation? (CO3, K1)	2
2.d.	Write the name of all three scientist who won the nobel prize for penicillin discovery? (CO4, K1)	2
2.e.	Why thermocouples are most widely used as temperature sensors? (CO5, K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Discuss in detail about the indirect methods of determining cell number density? (CO1, K2)	6
3-b.	Dissolved oxygen is an important substrate in aerobic fermentation. Justify this statement? (CO1, K2)	6
3-c.	Explain briefly about the batch operation of a mixed reactor? (CO2, K2)	6
3-d.	Discuss in detail about the chemostat with immobilized cells in a bioreactor? (CO2, K2)	6
3.e.	Discuss about the scale-up process of a bioreactor? (CO3, K3)	6
3.f.	Write any seven applications of bioprocess engineering? (CO4, K1)	6
3.g.	Discuss in detail about the common instruments used for process automation? (CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain microbial growth curve with its different phases along with a suitable graph? (CO1, K3)	10
4-b.	Illustrate the working mechanism of particle counter in detail? (CO1, K2)	10

5. Answer any one of the following:-

5-a.	Explain in detail about the different ways by which cells can be recycled in a fermentation process? (CO2, K3)	10
5-b.	Write the advantages of chemostat cascade and chemostat recycle with flow sheet? (CO2, K2)	10

6. Answer any one of the following:-

6-a.	With the help of labelled diagram, explain the steps for oxygen transfer from gas bubble to individual cell? (CO3, K2)	10
6-b.	A fermentation broth with viscosity 10^{-3} Pa s and density 1000 kg m^{-3} is agitated in a 100 m^3 baffled tank using a marine propeller 1.2 m in diameter. Calculate the power required for a stirrer speed of $5s^{-1}$. (Take k1 as 40 and Np ’ as 0.35 for marine propeller) (CO3, K3)	10

7. Answer any one of the following:-

7-a.	With the help of schematic diagram, discuss about the different stages of bioprocess development? (CO4, K1)	10
7-b.	Explain briefly about the downstream process of antibiotic production? (CO4, K2)	10

8. Answer any <u>one</u> of the following:-

8-a.	What is sterilization? Why is there the need of sterilization? What happens if the fermentation medium gets contaminated? (CO5, K3)	10
8-b.	Explain briefly about the factorial design and Plackett-Burman design for medium optimization? (CO5, K2)	10

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