Printed Page:- **Subject Code:- ABT0601**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (20 ..... - 20.....)

Subject: Bioseparation 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. In ion-exchange chromatography, proteins bound to the resin can be displaced by increasing the _____ (CO1, K1) 1

(a) strength of ionic buffer

(b) size of sample

(c) column volume

(d) column width

1-b. The pre -treatment filtration of the water involves the use of alum is known as- (CO1, K1) 1

(a) Clorination

(b) Coagulation

(c) Ultraviolet radiation treatment

(d) sedimentation

1-c. Why are chaotropic agents used in RNA isolation protocols? (CO2, K1) 1

(a) To prevent DNA contamination

(b) To denature RNases and stabilize RNA

(c) To neutralize pH

(d) To promote cell lysis

1-d. Why is ethanol used in DNA precipitation instead of water? (CO2, K1) 1

(a) DNA is more soluble in ethanol

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(b) Ethanol removes water from DNA's hydration shell

(c) Ethanol reacts with DNA to form a pellet

(d) Ethanol increases temperature

1-e. Streptavidin-coated magnetic beads bind specifically to: (CO3, K1) 1

(a) Glucose

(b) DNA

(c) Biotin

(d) Antibodies

1-f. If you are isolating His-tagged proteins, which type of functional group would you use on your magnetic beads? (CO3, K1) 1

(a) Carboxyl

(b) Ni-NTA

(c) Biotin

(d) PEG

1-g. In gas chromatography, the basis for separation of the components of the volatile material is the difference in (CO4, K1) 1

(a) partition coefficients

(b) conductivity

(c) molecular weight

(d) molarity

1-h. Isoelectric focusing separates proteins based on: (CO4, K1) 1

(a) Molecular weight

(b) Shape

(c) Isoelectric point (pI)

(d) Charge density

1-i. The purpose of product polishing is to: (CO5, K1) 1

(a) Enhance purity and stability

(b) Increase contamination

(c) Speed up fermentation

(d) Convert sugar

1-j. Which dryer offers shortest residence time with high surface area exposure? (CO5, K1) 1

(a) Fluidized bed dryer

(b) Tray dryer

(c) Rotary dryer

(d) Freeze dryer

2. Attempt all parts:-

2.a. What are coagulants, and how do they assist in flocculation? (CO1, K1) 2

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2.b.	Why is counter-current extraction more efficient than batch extraction? (CO2, K1)	2
2.c.	What is laminar flow in microfluidics? (CO3, K1)	2
2.d.	What is the biological use of chromatography? (CO4, K1)	2
2.e.	List some common piece of equipment's used in the production of biopharmaceuticals? (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Why is homogenization widely used for cell disruption in industrial biotechnology? (CO1, K1)	6
3-b.	Describe the various enzymatic cell disruption methods and their importance in bioprocessing? (CO1, K1)	6
3-c.	What are the main steps involved in DNA extraction from animal cells? (CO2, K1)	6
3-d.	How Langmuir adsorption isotherm is different from Freundlich adsorption isotherm. Describe briefly with the help of graph? (CO2, K1)	6
3.e.	Discuss in detail the basic composition and mechanism by which magnetic beads enable separation of target biomolecules? (CO3, K2)	6
3.f.	Why is gel filtration chromatography preferred for certain types of molecules? Give reasons to support your answer? (CO4, K1)	6
3.g.	What are the critical control points in the drying of high-value therapeutic proteins? (CO5, K1)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Describe various problems and challenges occur during bioproduct purification? (CO1, K1)	10
4-b.	A biotech firm needs to separate viruses from host cells. Which separation technique would be most suitable and why? (CO1, K1)	10

5. Answer any one of the following:-

5-a.	Briefly describe the principle, process, and advantages of supercritical fluid extraction in natural product isolation? (CO2, K1)	10
5-b.	Describe various techniques used to isolate plasmid DNA from bacterial cells? (CO2, K1)	10

6. Answer any one of the following:-

6-a.	Illustrate the complete workflow of using magnetic beads for the isolation of specific antibodies from serum? Also explain how yield and purity are validated? (CO3, K2, K3)	10
6-b.	What is cross linking immobilization? Discuss various cross-linking agents used in polymer bead immobilization and their effect on enzyme activity and stability? (CO3, K2)	10

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

7-a.	Explain the working methodology and application of LC-MS and GC-MS? (CO4, K2)	10
7-b.	Compare ion exchange chromatography with at least two other techniques used for protein or biomolecule separation? (CO4, K2)	10

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

8-a.	Recall recent technological advancements in equipment used for crystallization and their impact on biotechnological industry? (CO5, K1)	10
8-b.	Describe the various stages of crystallization and discuss how control of each stage influences product purity? (CO5, K1, K2)	10

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