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Printed Page:-4 **Subject Code:- ABT0501**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: V - THEORY EXAMINATION (2025 - 2026)
Subject: Analytical Techniques

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. The cathode of transmission electron microscope consists of a _____ (CO1, K1) 1

(a) tungsten wire
(b) bulb
(c) iron filament
(d) gold wire

1-b. Glutaraldehyde is a (CO1, K1) 1

(a) metal
(b) fixative
(c) non-metal
(d) atomic specie

1-c. Which force is at work in chromatography? (CO2, K1) 1

(a) Hydrogen bonding
(b) London force
(c) Electric static force
(d) All of the above

1-d. A paper chromatography and electrophoresis combination involves? (CO2, K1) 1

(a) Partition chromatography
(b) Electrical mobility of the ionic species
(c) Both (a) and (b)
(d) None of these

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1-e. Which of the following has a minimum wavelength? (CO3, K1) 1

(a) Gamma rays
(b) Blue light
(c) Infrared rays
(d) microwave

1-f. In Raman spectroscopy, the radiation lies in the _____ (CO3, K1) 1

(a) Microwave Region
(b) Visible Region
(c) UV Region
(d) X-ray Region

1-g. For the separation of DNA by electrophoresis, which of the following method is commonly used? (CO4, K1) 1

(a) Agarose – vertical
(b) Agarose – horizontal
(c) PAGE – vertical
(d) PAGE – horizontal

1-h. If proteins are separated according to their electrophoretic mobility then the type of electrophoresis is: (CO4, K1) 1

(a) SDS PAGE
(b) Affinity Electrophoresis
(c) Electro focusing
(d) Free flow electrophoresis

1-i. _____ is a process used quite often in the dairy industry. (CO5, K1) 1

(a) Centrifugal separation
(b) Sedimentation Theory
(c) Crystal Growth
(d) None of the above

1-j. What is the principle of centrifugation? (CO5, K1) 1

(a) a) Sedimentation principle
(b) b) Filtration principle
(c) c) Evaporation principle
(d) d) Size reduction principle

2. Attempt all parts:-

2.a. What is the function of microscope? (CO1, K1) 2

2.b. Why is filter paper used in chromatography? (CO2, K1) 2

2.c. What is Beer Lambert's law? (CO3, K1) 2

2.d. What is the purpose of electrophoresis? (CO4, K1) 2

2.e. How can we prevent sedimentation? (CO5, K1) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Differentiate between fluorescent microscopy and light microscopy? (CO1, K3)	6
3.a.(ii)	Describe the various components of fluorescence microscope and write its applications? (CO1, K1,K3)	6

3.b. Answer any one of the following:-

3.b.(i)	Summarize the process of elution of proteins in affinity chromatography? (CO2, K2)	6
3.b.(ii)	What determines retention time in chromatography? Why do different compounds have different retention times? Explain in detail? (CO2, K2)	6

3.c. Answer any one of the following:-

3.c.(i)	Explain in detail the two basic approaches for the synthesis of nanomaterials? (CO3, K2)	6
3.c.(ii)	Which tests can be performed by mass spectrometry in a clinical laboratory? (CO3, K1)	6

3.d. Answer any one of the following:-

3.d.(i)	Define the basic principle of electrophoresis. What are different types of factors that could affect migration of molecules in the gel electrophoresis? (CO4, K1)	6
3.d.(ii)	What will happen if the voltage used for electrophoresis is not steady? (CO4, K1)	6

3.e. Answer any one of the following:-

3.e.(i)	What are the main objectives of using an analytical ultracentrifugation? (CO5, K1)	6
3.e.(ii)	What are the most common errors while operating a centrifuge? (CO5, K1)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Describe in detail the principle and components of different types of microscopy? (CO1, K1)	10
4-b.	Explain the working principle and applications of atomic force and confocal microscopy? (CO1, K2,K3)	10

5. Answer any one of the following:-

5-a.	Define size exclusion chromatography. Describe the principle, components and applications of size exclusion chromatography? (CO2, K1,K3)	10
5-b.	Why is chromatography used as the purification technique? Discuss in detail? (CO2, K2)	10

6. Answer any one of the following:-

6-a.	Discuss the working principle of Surface Plasmon Resonance (SPR)? (CO3, K2)	10
6-b.	What is atomic emission spectroscopy? Differentiate between atomic absorption and atomic emission spectroscopy in context to principle and working procedure? (CO3, K3)	10

7. Answer any one of the following:-

7-a.	Why is 2-D electrophoresis better than single dimension electrophoresis? (CO4, K1)	10
7-b.	Discuss in detail about SDS PAGE? Write down the principle and applications of various electrophoresis techniques? (CO4, K2,K3)	10

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

8-a.	What do you understand by preparative centrifugation? Discuss the principle and applications of preparative and analytical centrifugation? (CO5, K1,K3)	10
8-b.	Discuss in detail about various types of centrifugation? Write down the various factors that affects centrifugation? (CO5, K2)	10