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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2024- 2025)

Subject: Analytical Technique

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 greatest resolution in light microscopy can be obtained with (CO1, K1) 1

(a) Longest wavelength of visible light used

(b) An objective with minimum numerical aperture

(c) Shortest wavelength of visible light used

(d) Shortest wavelength of visible light used and an objective with the maximum numerical aperture

1-b. Oil immersion objective lens has an NA value of (CO1, K1) 1

(a) 0.65

(b) 0.85

(c) 1.33

(d) 1

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. Ion exchange chromatography is based on the (CO2, K1) 1

(a) Electrostatic attraction

(b) Electrical mobility of ionic species

(c) Adsorption chromatography

(d) Partition chromatograph

1-e. In atomic absorption spectroscopy the most strongly absorbed light is called as (CO3, K1) 1

(a) Resonance line

(b) Base line

(c) Stokes line

(d) anti stokes line

1-f. Cold vapor method is used for detection of (CO3, K1) 1

(a) Cs

(b) Hg

(c) Ge

(d) Cd

1-g. Which technique separates charged particles using electric field? (CO4, K1) 1

(a) Hydrolysis

(b) Electrophoresis

(c) Protein synthesis

(d) Protein denaturing

1-h. Which of the following statements is true about migration of biomolecules? (CO4, K1) 1

(a) The rate of migration is directly proportional to the resistance of medium

(b) Rate of migration is directly proportional to current

(c) Low voltage is used for separation of high mass molecules

(d) Rate of migration is inversely proportional to current

1-i. Which of the following is use of centrifugal separation? (CO5, K1) 1

(a) Clarification

(b) Skimming

(c) Bactofuge treatment

(d) All of the above

1-j. What is the role of density gradient centrifugation? (CO5, K1) 1

(a) To purify viruses, ribosomes, membranes

(b) Toremovedirt

(c) To remove fine particles

(d) To remove large particles

2. Attempt all parts:-

2.a. What is the resolving power of light microscope? (CO1, K2) 2

2.b. Why is water not used in chromatography? (CO2, K2) 2

2.c. What is the effect of solvent on the absorption of UV visible spectroscopy? (CO3, 2

	K2)	
2.d.	What are the three main uses for electrophoresis? (CO4, K2)	2
2.e.	What is the purpose of a centrifugal pump? (CO5, K2)	2
SECTION-B		30
3. Answer any five of the following:-		
3-a.	Describe the key feature of confocal microscopy? (CO1, K2)	6
3-b.	Enlist the disadvantages of using a light microscope? (CO1, K2)	6
3-c.	How does separation occur in gas chromatography? Explain. (CO2, K2)	6
3-d.	Summarize the process of elution of proteins in affinity chromatography? (CO2, K2)	6
3.e.	What techniques are used to determine the size and shape of nanoparticles? Explain in brief. (CO3, K2)	6
3.f.	What factors affect the separation of samples in gel electrophoresis? (CO4, K2)	6
3.g.	Describe the applications of analytical centrifugation? (CO5, K2)	6
SECTION-C		50
4. Answer any one of the following:-		
4-a.	Illustrate the working principle of AFM, What kind of samples can be analysed by AFM? Give the applications of AFM? (CO1, K3)	10
4-b.	Explain the working principle of SEM with the help of a suitable diagram. Give a note on the parts of SEM. (CO1, K3)	10
5. Answer any one of the following:-		
5-a.	What are the essential components of an HPLC system? Detail the problems encountered during HPLC analysis and their troubleshooting? (CO2, K3)	10
5-b.	Which type of chromatography would be most useful to purify a hydrophobic molecule? Describe the industrial applications of such chromatography. (CO2, K3)	10
6. Answer any one of the following:-		
6-a.	Write down the difference between atomic absorption and atomic emission spectroscopy. (CO3, K4)	10
6-b.	Differentiate between the CT and PET scans. What are the limitations of PET scans? (CO3, K4)	10
7. Answer any one of the following:-		
7-a.	How can electrophoresis be utilized as a method to purify biomolecules in a laboratory setting? (CO4, K3)	10
7-b.	How would you apply the principles of SDS-PAGE to analyze the purity of a protein sample in a laboratory experiment? (CO4, K3)	10
8. Answer any one of the following:-		
8-a.	How can different types of centrifuges be utilized in various laboratory applications? (CO5, K3)	10

8-b. How would you utilize the principle of sedimentation in centrifugation to separate cellular components in a laboratory experiment? (CO5, K3) 10