(c) Describe the applications of autoradiography in molecular biology and cell biology, with specific examples. What are the safety considerations when working with radioactive materials ?   7+3=10

(d) Describe the principle and procedure of High-Performance Liquid Chromatography (HPLC). How does HPLC improve upon traditional column chromatography ?   6+4=10

(e) Compare and contrast AGE and PAGE. Explain how SDS-PAGE is used to separate proteins. Discuss the factors that affect the migration of proteins in SDS-PAGE.   2+6+2=10

(f) Explain the concept of standard deviation and its role in describing the spread of data. Discuss how the standard deviation is calculated and how it is used to determine the variability within a dataset with proper example ?   6+4=10

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2025

BOTANY

(Honours Elective)

Paper : BOT–HE–6026

(Analytical Techniques in Plant Sciences)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer all questions.

1. Answer the following questions very briefly : $1 \times 7 = 7$

(a) SEM samples are typically coated with : a fluorescent dye (e.g. rhodamine)/a heavy metal (e.g. gold)/a radioactive isotope (e.g. C^{14})/an enzyme (e.g., catalase). (*Choose the correct answer*)

(b) What is the purpose of SDS in SDS-PAGE ?

(c) What does MALDI stand for in mass spectrometry ?

(d) What is the half-life of a radioisotope ?

(e) Negative staining is commonly used to visualize: Internal cellular structures/ Viruses and macromolecules/DNA sequences/Protein folding.

(Choose the correct answer)

(f) Define Rf value in chromatography.

(g) What is a parameter in statistics ?

2. Answer the following questions in brief :

2×4=8

(a) What are the advantages of using cryofixation over chemical fixation for electron microscopy ?

(b) Name *two* factors that affect the sedimentation rate of particles during centrifugation.

(c) Explain the principle of ion-exchange chromatography.

(d) Cite one advantage each for tabular and graphical representation of data.

3. Write short notes on the following :
(any three)   5×3=15

(a) FISH

(b) Sucrose density gradient centrifugation

(c) Pulse chase experiment

(d) Molecular sieve chromatography

(e) Measures of central tendency

4. Answer *any three* of the following questions :   10×3=30

(a) Explain the principle of confocal microscopy. Describe the components of a confocal microscope and discuss its advantages over conventional wide-field fluorescence microscopy. Enlist some applications of confocal microscopy.   2+6+2=10

(b) Describe the use of $CsCl_2$ density gradient centrifugation for the separation and purification of nucleic acids. Discuss the applications of this technique in molecular biology research.   6+4=10