Sl. No. of Ques. Paper : 1326   **F-7**

Unique Paper Code   : 2161504

Name of Paper   : **Analytical Techniques in Plant Sciences**

Name of Course   : **B.Sc. (Hons.) Botany (FYUP)**

Semester   : **V**

Duration :   : **3 hours**

Maximum Marks   : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all. Question No. 1 is compulsory.
Attempt all parts of a question together.

Illustrate your answers with labelled diagrams.

1. (A) Name the technique used for following. Attempt any *five*.

   (i)   To separate nucleic acids based on molecular weight differences.

   (ii) To determine the 3-D structure of proteins.

   (iii) To examine the detailed surface architecture of specimens.

   (iv) To separate the *four* principal chloroplast pigments.

   (v)   To study the detailed structure of chromosomes.

   (vi) To obtain pure fractions of organelles.

   (vii) To plot the standard curve of a coloured and soluble compound.   1×5=5

   (B) Fill in the blanks. Attempt any *five*.

   (i)   The sedimentation coefficient is expressed as .... units.

   (ii) The marker enzyme for chloroplasts is ....

   (iii) A microscope has a 4X ocular lens and a 10X objective; the microscope's total magnification is .... X.

   (iv) The instrument used for obtaining sections of uniform thickness for observing under the microscope is called the ....

   (v)   .... is a commonly used adsorbent in TLC.

   (vi) .... is a fluorescent dye used to stain DNA.

   (vii) In AGE, the higher the concentration of agarose used, ... is the pore size formed.   1×5=5

(C) Match the columns:

A		B	
(i)	Affinity chromatography	(a)	Vacuum column
(ii)	Centrifuge	(b)	Pin-hole aperture
(iii)	Electron microscope	(c)	Rotor
(iv)	Confocal microscope	(d)	Biostatistics
(v)	Chi-square value	(e)	Biomolecular interaction

1×5=5

2. Write short notes on any *three* of the following:

(a) Sample preparation for light microscopy

(b) Density gradient centrifugation

(c) X-ray crystallography

(d) Gel filtration chromatography

(e) Scanning electron microscopy. 5×3=15

3. Differentiate between the following. Attempt any *three*.

(a) Freeze fracturing and freeze etching

(b) Fluorescence microscope and confocal microscope

(c) Paper chromatography and thin layer chromatography

(d) Agarose gel electrophoresis and polyacrylamide gel electrophoresis

(e) Colorimetry and spectrophotometry. 5×3=15

4. Give brief answers to the following. Attempt any *five*.

(a) Explain why pulse-chase experiments are valuable in biology.

(b) Describe the different ways of representing biological data.

(c) Name a positive stain, a negative stain and an embedding material used in TEM.

(d) Explain how native polyacrylamide gel electrophoresis is different from SDS-PAGE.

(e) Why are fixatives used during sample preparation for microscopy?

(f) Explain why DNA moves towards the positive electrode in AGE.

(g) What is a probe, and how are probes used in FISH?

5×3=15

5. Answer any *three* of the following:

   (a) Discuss Beer-Lambert law

   (b) Using a ray diagram, explain the working of a transmission electron microscope. Write a brief account on the applications of the technique.

   (c) What is meant by cell fractionation? Discuss the importance of the conditions/factors during homogenization of the tissue.

   (d) Explain the terms data, population, sample, and parameter in the context of biostatistics.   5×3=15

6. Attempt any *three* of the following:

   (a) Draw a ray diagram showing the pathway of light in a light microscope. Differentiate magnification from resolution.

   (b) The heights in cm of ten maize plants are given below:

   120, 150, 130, 120, 140, 145, 135, 120, 150, and 140

   Calculate the mean, the median, the mode, the variance, and the standard deviation using the given data.

   (c) Write an account on chromosome banding technique and its applications.

   (d) Expand HPLC. Write an account of the technique.   5×3=15

7. Describe the following techniques and their applications. Attempt any *three*.

   (a) Autoradiography

   (b) Mass spectrometry

   (c) Shadow casting

   (d) Analytical ultracentrifugation

   (e) Flow cytometry   5×3=15