BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Sc.(BT)-Hons-2022
Course Name – Bioanalytical Tools and Techniques
Course Code - BBTC405
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the NA value of an oil immersion lens

a) 0.65 b) 0.85
c) 1.33 d) 1

(ii) Cite what will be the greatest resolution of a light microscopy that can be obtained with —

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

(iii) Select from the following, how the total magnification in a compound microscope is achieved

a) Magnifying power of the objective lens
b) Magnifying power of eyepiece
c) Magnifying power of condenser lens
d) Magnifying power of both the objective lens and eyepiece

(iv) The secondary electrons radiated back in scanning microscope is collected by?

a) specimen b) anode
c) vacuum chamber d) cathode

(v) Cite which microscope property is utilized to enhance contrast in specimens in phase contrast microscopy

a) Scattering b) Absorption
c) Interference d) Reflection

(vi) Show the primary purpose of fluorescence spectroscopy in water research?

a) Detection of heavy metals b) Monitoring organic pollutants
c) Determining water pH d) Analyzing dissolved gases

(vii) Judge which type of spectroscopy can be used to differentiate malignant skin tumors from benign?

a) Fluorescence spectroscopy
b) Infrared spectroscopy
c) Raman spectroscopy
d) X-ray spectroscopy

(viii) Recall which technique uses fluorescence to redirect photons?

a) Fluorescence solar collector
b) Raman spectroscopy
c) Atomic Absorption Spectroscopy (AAS)
d) Mass spectrometry

(ix) Identify which chromatographic technique separates components based on their size and shape using porous beads as the stationary phase.

a) Gel filtration chromatography
b) Affinity chromatography
c) Ion exchange chromatography
d) Reverse-phase chromatography

(x) Determine the primary purpose of a mobile phase in chromatography.

a) To dissolve the analytes
b) To facilitate the separation of analytes
c) To interact with the stationary phase
d) To immobilize the analytes

(xi) Identify the correct statement applicable to chromatography

a) Synthesis of chemical compounds
b) Separation, identification, and purification of components in a mixture
c) Chemical bonding of molecules
d) Measurement of reaction kinetics

(xii) Determine the principle of separation in affinity chromatography?

a) Differences in size
b) Differences in charge
c) Reversible binding between ligand and compound
d) Partitioning between two phases

(xiii) Cite the type of chromatography is suitable for separating biomolecules sensitive to changes in pH?

a) Affinity chromatography
b) Gel filtration chromatography
c) Ion exchange chromatography
d) Gas chromatography

(xiv) Identify the specific pH at which the net charge of a protein is zero?

a) Isoelectric point
b) Neutral point
c) Acidic point
d) Basic point

(xv) Cite the role of nanobiotechnology in the food sector?

a) Developing new cooking techniques
b) Improving food packaging
c) Enhancing food safety and preservation
d) Increasing crop yields

Group-B

(Short Answer Type Questions) 3 x 5=15

2. What property of light does phase-contrast microscopy primarily utilize to visualize transparent specimens? (3)
3. Discuss how IR spectroscopy complement other spectroscopic techniques like UV-vis spectroscopy in chemical analysis. (3)
4. Differentiate between native PAGE and SDS-PAGE. (3)
5. Determine how does two-dimensional chromatography differ from one-dimensional chromatography in TLC? (3)
6. Explain nanotechnology. (3)

OR

Write short note on HPLC. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Explain the concept of image resolution in electron microscopy. How is resolution determined, and what factors can affect the resolution of electron microscope images? (5)

8. Summarize the setup and operation of pulse field gel electrophoresis. (5)
9. Define the principle behind dark field microscopy and how does it affect the illumination of the specimen? (5)
10. Explain the differences between spectrophotometry and spectroscopy, highlighting their respective focuses and outcomes. (5)
11. Contrast moving boundary and zone electrophoresis (5)
12. Evaluate the advantages and disadvantages of paper chromatography. (5)

OR

Judge the factors influencing the separation process in chromatography, and how do they contribute to the separation of components? (5)

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