

**B.Sc.-M.Sc. INTEGRATED PROGRAMME (BIOTECHNOLOGY)
SEMESTER IV, ONLINE EXAMINATION, MAY-JUNE 2021
PAPER CODE - BBT-CC13**

PAPER TITLE: BIO-ANALYTICAL TOOLS

Time : Three Hours

Maximum Marks : 75

Attempt all questions. All parts of a question must be attempted in continuation. Start answer of a fresh question on a new page. Cite examples and draw labeled diagrams wherever necessary

Question No. 1:

Choose the correct answers of the following :

[15 x 1 = 15]

- 1) Resolving power of a microscope is a function of
 - a) Wavelength of light used
 - b) Numerical aperture of the lens system
 - c) Refractive index
 - d) Wavelength of light used and numerical aperture of the lens system
- 2) Which of the following are true for electron microscopy?
 - a) Specimen should be thin and dry
 - b) Image is obtained on a phosphorescent screen
 - c) Electron beam must pass through evacuated chamber
 - d) Specimen should be thin and dry, the image is obtained on a phosphorescent screen and electron beam must pass through the evacuated chamber
- 3) The degree of scattering in the transmission electron microscope depends upon
 - a) Wavelength of electron beam used
 - b) Number of atoms that lie in the electron path
 - c) Number and mass of atoms that lie in the electron path
 - d) Mass of atoms that lie in the electron path
- 4) If the absorption of electromagnetic radiation by matter results in the emission of radiation of the same or longer wavelengths for a long or a short time, the phenomenon is termed as
 - a) Luminescence
 - b) Fluorescence
 - c) Phosphorescence
 - d) Spontaneous emission
- 5) Electron microscope employs
 - a) Fluorochromes
 - b) Polarizer and analyzer filters
 - c) Objective and ocular lenses
 - d) Electromagnetic lenses
- 6) Isopycnic or equal density centrifugation is achieved in
 - a) Buoyant density centrifugation
 - b) Density gradient centrifugation
 - c) Electrophoresis
 - d) Differential centrifugation

- 7) Which chromatographic methods used for the desalting purpose?
 - a) Ion-exchange chromatography
 - b) Gel permeation chromatography
 - c) Both
 - d) None
- 8) Type of chromatography that uses a column of ligands is
 - a) Affinity chromatography
 - b) Adsorption chromatography
 - c) Ion exchange chromatography
 - d) Gel fractionation chromatography
- 9) The unit of mean residue ellipticity is
 - a) degree $\text{cm}^2 \text{dmol}^{-1}$
 - b) degree $\text{cm}^{-2} \text{dmol}^{-2}$
 - c) degree $\text{cm}^{-1} \text{dmol}^{-1}$
 - d) degree² $\text{cm} \text{dmol}^{-2}$
- 10) Which of the following statements about agarose gel electrophoresis is False?
 - a) Electrophoresis in agarose is a common way to separate DNA molecules according to size.
 - b) Ethidium bromide is used to detect DNA.
 - c) Under the influence of the electrical field, positively charged DNA will migrate towards the negatively charged end of the gel.
 - d) None of them
- 11) In a native PAGE, proteins are separated on the basis of
 - a) Total negative charge
 - b) Net charge and size
 - c) Net positive charges and size
 - d) Total positive charge
- 12) The subunit molecular weight, as well as the number of subunits in the quaternary structure, can be determined by
 - a) SDS-PAGE
 - b) Gel filtration chromatography
 - c) Combination of information from (a) and (b)
 - d) Isoelectric focusing
- 13) Nano-sized polymers built from branched units are called,
 - a) Dendrimers
 - b) Composites
 - c) Carbon-based materials
 - d) Metal-based materials
- 14) Property of nanoparticles provides a driving force for diffusion?
 - a) Optical Properties
 - b) High surface area to volume ratio
 - c) Sintering
 - d) There is no such property
- 15) Which of the following converts biochemical events into measurable signals?
 - a) Amplifier
 - b) Opamp

- c) Rectifier
- d) Transducer

Question No. 2:

[3 x 5 = 15]

Explain in brief, any THREE of the following:

- A. Highlight significant differences in the working principle of scanning and transmission electron microscopes.
- B. Draw a schematic diagram of a UV-visible spectrophotometer.
- C. How the molecular mass of a protein estimated by gel filtration chromatography?
- D. What is the difference between stacking and resolving gels in SDS-PAGE?
- E. Explain the native gel electrophoresis. Under what circumstances, we prefer to use native gel electrophoresis?

Question No. 3:

[3 x 5 = 15]

Explain in detail, any THREE of the following:

- A. Define bead volume, void volume and bed volume. Discuss the process of column packaging.
- B. Discuss differential centrifugation and its use in cell fractionation.
- C. Discuss Circular Dichroism (CD) with illustration.
- D. Discuss different types of resins used in Ion-Exchange chromatography. Highlight their advantages.
- E. Describe the working principle and instrumentation of ITC.

Question No. 4:

[1 x 15 = 15]

Attempt any ONE of the following:

- A. Discuss the working principle, instrumentation and major application of thin layer chromatography.
- B. Describe the principle, schematic diagram and application of HPLC.

Question No. 5:

[1 x 15 = 15]

Attempt any ONE of the following:

- A. What is biosensor technology? Discuss different types of biosensor technology and their advantages and applications.
- B. Discuss the principle, instrumentation and applications of agarose gel electrophoresis and pulse field gel electrophoresis.

It should be noted that 60 minutes extra time will be provided to scan your answer sheets, build a PDF and upload it to biotechnologyexam2020@gmail.com