



BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – M.Sc.(BT)-2022/M.Sc.(BT)-2023
Course Name – Optical Instrumentation
Course Code - MBTC104
(Semester I)

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) What does the Franck-Condon principle describe in the context of molecular spectroscopy
- a) The tendency of molecules to absorb light of specific wavelengths
- b) The relationship between a molecule's electronic transitions and its vibrational motion
- c) The emission of light when an excited molecule returns to its ground state
- d) The scattering of light by molecules in the gas phase
- (ii) Which of the following is a common application of Polarization Microscopy?
- a) Counting bacteria in a sample
- b) Identifying elements in a mineral sample
- c) Measuring the temperature of a liquid
- d) Examining crystal structures in materials
- (iii) A boy uses spectacles of focal length -50 cm. Name the defect of the vision he is suffering from
- a) Astigmatism
- b) Hypermetropia
- c) Myopia
- d) Presbyopia
- (iv) Two lenses of focal lengths 5 cm and 50 cm are to be used for making a telescope. Interpret the lens that you will use for the objective?
- a) Both
- b) Neither
- c) 5 cm
- d) 50 cm
- (v) In a phase transition energy diagram, where is the potential energy typically the lowest
- a) Reactants state
- b) Products state
- c) Transition state
- d) Activation energy peak
- (vi) According to the Beer-Lambert Law, what is the relationship between the absorbance of a sample and its concentration
- a) Absorbance is directly proportional to concentration
- b) Absorbance is inversely proportional to concentration
- c) Absorbance and concentration are unrelated
- d) Absorbance increases exponentially with concentration

10. Describe the concept of electronic transitions in atoms and molecules. How do electronic transitions relate to the absorption and emission of light, and what factors influence the energy of these transitions? (5)
11. Derive the mathematical relationship between energy (E), wavelength (λ), and the speed of light (c) for electromagnetic waves. How does this relationship help explain the energy-wavelength behavior in various regions of the electromagnetic spectrum? (5)
12. Discuss how the energy-wavelength relationship applies to the concept of color in visible light. Explain how different colors of light are associated with varying wavelengths and energies, and provide examples of colors at specific wavelengths. (5)

OR

Discuss the impact of ionizing electromagnetic radiation, such as X-rays and gamma rays, on proteins and DNA. Explain the mechanisms by which these high-energy radiation types can cause damage to biomolecules and the potential consequences for cellular function and genetic stability. (5)
