

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT  
TEST -1 EXAMINATION- 2024

MSc-III Semester (BT)

Course Code (Credits): 20MS1BT312 (2)

Max. Marks: 15

Course Name: Emerging Technology

Course Instructors: Dr. Abhishek

Max. Time: 1 Hour

**Note: (a) All questions are compulsory.**

**(b) Marks are indicated against each question in square brackets.**

**(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems**

- Raman spectroscopy is a versatile, nondestructive technique that yields detailed information about chemical structure. Raman spectroscopy is based on the inelastic scattering of light, whereby the scattered light is altered in frequency by the loss (or gain) of vibrational quanta to (or from) the molecules it impinged on. For raman spectroscopic studies
  - A sample was excited by the 4358 angstrom line of mercury. A raman line was observed at 4447 angstrom. Calculate the raman shift in ( $\text{cm}^{-1}$ ) [2.5]
  - Using radiation of wavelength  $4 \times 10^3$  angstrom, the first stoke line appears at a spacing of  $350 \text{ cm}^{-1}$  from the Rayleigh line. Calculate the frequency of the first antistoke line in wavenumber. [2.5]
  - What do you understand by molecular polarization [1]
- UV-Vis spectroscopy is a cost-effective, simple, versatile, non-destructive, and analytical technique, which is suitable for a large spectrum of organic compounds and some inorganic species. As a function of wavelength, UV-Vis spectrophotometers measure the absorption or transmission of light that passes through a medium. UV-Vis spectrophotometer techniques are applicable to a wide range of research disciplines, namely agriculture, food, pharmaceutical, environment, and many others. For sample analysis
  - $2.5 \times 10^{-4} \text{ M}$  solution of a substance in a 1cm length cell at  $\lambda_{\text{max}}$  254 nm has absorbance 1.17. Calculate  $\epsilon_{\text{max}}$  for this transition [2]
  - When a UV light is passed through the given solution, the radiant power is reduced to 50%, calculate the absorbance [2]
- Rohan, a student taking of emerging Technology, looks at a long-standing puddle outside his dorm window. Curious as to what was growing in the cloudy water, he takes a sample to his lab. He wanted to know whether the organisms in the sample were prokaryotic or eukaryotic.
  - Using a light microscope, how could he tell the difference between a prokaryotic organism and a eukaryotic one? [1.5]
  - If Rohan have to light source of wavelength 200 nm and 550 nm respectively, then which light source he will prefer to observe smallest organism (microorganism) and why? [1.5]
  - What do you understand by resolving power and numerical aperture of compound microscope [2]