

# School of Basic and Applied Sciences

Chemistry  
ETE - Jun 2023

Time : 3 Hours

Marks : 100

## Sem IV - C1UB401B - Quantum Mechanics and Analytical Techniques

*Your answer should be specific to the question asked*

*Draw neat labeled diagrams wherever necessary*

1. Outline the key aspects of Raman Spectroscopy, and its advantages. K1 CO3 (5)
2. Interpret the applicability of Heisenberg's Uncertainty Principle in establishing wave nature of particles. K1 CO1 (5)
3. Choose from the given set of compounds, which ones are microwave active and give proper reasoning for the same: ozone, carbon tetrachloride, iodine chloride, carbon disulphide, boron trifluoride. K2 CO2 (5)
- 4) Inspect the applicability of Lambert-Beer's law in analytical chemistry. K3 CO4 (10)

### OR

- Evaluate the relevance fundamental rule of UV/Visible spectroscopy and elaborate upon its applicability. K3 CO4 (10)
5. List and discuss in detail postulates of quantum mechanics. K2 CO1 (10)
  6. Apply the idea of quantization of energy to justify the origin of UV/vis spectra. K4 CO3 (10)
  7. Develop a schematic representation of a typical rotational spectrum making use of the energy expression of rotational levels. K3 CO2 (10)
  - 8) Elaborate what do you understand by solvent extraction. Prove that multiple extraction is better than single extraction. K4 CO6 (15)

### OR

- Elaborate upon several types of chromatographic techniques, also define what is stationary phase and mobile phase. K4 CO6 (15)
9. Elaborate upon advances in quantum mechanics and analytical techniques. K4 CO5 (15)
  10. Explain the following phenomenon: chromophore, auxochrome, bathochromic shift, hypsochromic shift, also mention the law responsible for prediction of  $\lambda_{max}$ . K3 CO4 (15)