

Part 1 – EPR

1. Draw powder EPR spectra characterized by isotropic, axial and orthorhombic symmetry. What interpretation difficulties may be encountered during the analysis of the powder EPR spectrum?
2. Give a molecular interpretation of the parameters of the tensors g and A .
3. Describe methods of manipulating the spatial orientation of the spin magnetic dipole moment and the basic experiment of Hahn spin echo generation. Explain the basic differences between NMR and EPR Fourier techniques.

Part 2 – Raman Spectroscopy

1. Similarities and differences between Surface Enhanced Raman Spectroscopy (SERS) and Tip-Enhanced Raman Spectroscopy (TERS).
2. Discuss chosen technique of nonlinear Raman spectroscopy.
3. What information on the sample may be provided by Raman Imaging combined with AFM?

Part 3 – Infrared spectroscopy

1. Methodology of measuring acid-redox properties of solids by IR. Qualitative and quantitative aspect.
2. Time-resolved IR spectroscopy. What kind of information is provided by rapid scanning techniques?
3. The interaction of a molecule with the surface. What information can be obtained from the IR spectroscopic measurement?

Part 4 – NMR

1. Homo- and heteronuclear techniques of two-dimensional NMR spectroscopy
2. The AIDA-NMR experiment as a technique to study protein/inhibitor interactions
3. DEPT NMR technique, types and applications.

Part 5 – Mass Spectrometry

1. Discuss soft ionizations in mass spectrometry
2. Mass spectrometry in proteomics
3. Compare the quadrupole analyzer with the TOF