

APPLICATIONS OF MASS SPECTROSCOPY IN BIOLOGY

DR. SHUCHI SHARMA

- ⊙ These include identifying unknown compounds, determining the isotopic composition of elements in a molecule, and determining the structure of a compound by observing its fragmentation.
- ⊙ Other uses include quantifying the amount of a compound in a sample or studying the fundamentals of gas phase ion chemistry.

ISOTOPE-RATIO MS—

- ⦿ Mass spectrometry is also used to determine the isotopic composition of elements within a sample
- ⦿ Isotope-ratio MS (IRMS) is a technique that measures the relative stable isotopic abundance of elements. The elemental isotope ratio can be analyzed for a complex system (bulk IRMS), for a specific compound within a mixture.

MEMBRANE-INTRODUCTION MASS SPECTROMETRY: MEASURING GASES IN SOLUTION [EDIT]

- Membrane-introduction mass spectrometry combines the isotope ratio MS with a reaction chamber/cell separated by a gas-permeable membrane. This method allows the study of gases as they evolve in solution. This method has been extensively used for the study of the production of oxygen by Photosystem.

PROTEIN CHARACTERIZATION

- Mass spectrometry is an important method for the characterization and sequencing of proteins. The two primary methods for ionization of whole proteins are electrospray ionization (ESI) and matrix-assisted laser desorption/ionization (MALDI).
- Characterization of proteins and protein complexes, sequencing of peptides, and identification of posttranslational modification.

- ⦿ Mass spectrometers are also widely used in space missions to measure the composition of plasmas.
- ⦿ Cancer screening and diagnosis, global metabolic fingerprinting analysis, biomarker discovery and profiling, biofuels generation and use, lipidomics studies, and metabolic disorder profiling.

- ◉ Drinking water testing, pesticide screening and quantitation, soil contamination assessment, carbon dioxide and pollution monitoring, and trace elemental analysis of heavy metals leaching.
- ◉ Clinical drug development, Phase 0 studies, clinical tests, disease screening, drug therapy monitoring, analysis of peptides used for diagnostic testing, and identification of infectious agents for targeted therapies.

- Drug discovery and absorption, distribution, metabolism, and elimination studies, pharmacokinetic and pharmacodynamic analyses, metabolite screening, and preclinical development are analysed using MS.