Scientific-Disciplinary Sector (SSD): CHIM01 – Analytical Chemistry

Academic year: 2017-2018
Faculty: Department of Chemistry – School of Sciences and Technologies
Study courses: Instrumental Analytical Chemistry
Study plans/Curricula: Master Degree in Chemical Sciences
Type: Characterizing didactic activity (type b exam)
Total Credits: 6 (5 of lectures, 1 of laboratory activity)
Didactic Methods: lectures and laboratory activity
Didactic Period: 1st year, 2nd semester (March-June)
Exam type: Oral
Professor in charge: **Ilario Losito**

Training objectives: Acquisition of knowledge on principles, instrumentation and applications of advanced mass spectrometry techniques. Acquisition of expertise on the use of mass spectrometers.

Prerequisites: Knowledge of main topics in Instrumental Analytical Chemistry and Physics

Didactic Methods: Class lectures with PowerPoint presentation, laboratory activities

Course programme
PROGRAMME:
Lectures: (40 h – 20 lessons lasting 2 h)

1. General introduction to mass spectrometry; IUPAC terminology for mass spectrometry; isotopic distributions.
2. Electron ionization
3. Chemical ionization
4. Fast Atom Bombardment mass spectrometry
5. Matrix Assisted Laser Desorption Ionization mass spectrometry; Desorption-ionization on silicon
6. Electrospray Ionization and Desorption Electrospray Ionization
7. General concepts on mass analyzers: resolving power, mass accuracy, duty cycle
8. Quadrupole mass analyzers
9. 3D Ion Traps
10. Linear Ion Traps
11. Time of Flight mass analyzers
12. Hybrid mass spectrometers including Time of Flight analyzers
13. Ion Cyclotron Resonance mass spectrometry

14. Orbitrap mass analyzer
15. Tandem mass spectrometry
16. Acquisition rate in mass spectrometry
17. Applications of mass spectrometry to proteomics: protein identification
18. Applications of mass spectrometry to proteomics: peptide sequencing
19: Applications of mass spectrometry to lipidomics
20: Secondary Ion Mass Spectrometry

Laboratory sessions: (15 h)

1. Identification of an unknown protein from its Peptide Mass Fingerprint
2. Identification of a peptide from its tandem mass spectrum
3. Identification of a phospholipid from the relevant MS and tandem MS data

Reference Texts

J.H. Gross, Spettrometria di Massa, Edises, Napoli, 2016
Literature articles suggested by the teacher