

COURSE TITLE
LABORATORY OF ANALYTICAL CHEMISTRY
(Bachelor in Chemistry)

Prof. Diana Amorello (e-mail: diana.amorello@unipa.it)
Classroom site: Viale delle Scienze Edificio 17 (Building 17) M. Ruccia Room
Laboratory site: Viale delle Scienze Edificio 17 (Building 17), Analytical Chemistry Lab.

Credits (CFU) = 8

COURSE PROGRAM

face-to-face lectures (4 CFU, 32 hrs)

laboratory (4 CFU, 60 hrs)

APPLIED STATISTICS

Experimental error – Random and systematic error – propagation of random error– mean and standard deviation- confidence level - outliers – linear regression – least squares method- interpolation and extrapolation- standard additions.

GRAVIMETRIC ANALYSIS

Precipitation methods – The colloidal state – Supersaturation- Coprecipitation and postprecipitation – Precipitation from homogeneous solution - Applications.

VOLUMETRIC ANALYSIS

Acid-base titrations – titration curves - indicators - choice of indicators- standardization of strong acids and bases.

Argentometric titrations – titration curves - detection of end point according to Mohr, Volhard, Fajans.

Titration with EDTA – conditional stability constants - titration curves – auxiliary complexing agents – metallocromic indicators – types of titrations with EDTA.

Redox titrations - titration curves - redox indicators- oxidation with potassium permanganate, ceric sulphate and potassium dichromate – Iodometric methods.

ELETTROCHEMICAL METHODS

Conductometry: apparatus and measurements- conductance – equivalent conductance at infinite

dilution– law of independent migration of ions - conductometric titrations.

Potentiometry: indicator and reference electrodes- membrane electrodes- glass electrode for pH measurements – errors in pH measurements- calibration of a glass electrode- ion sensitive electrodes – potentiometric titrations- end point detection with graphical and analytical methods – second derivative method - Gran method.

General principles of polarographic analysis.

OPTICAL METHODS

Light properties- light absorption- Lambert-Beer's law- absorbance measurements- applications- deviation from Lambert-Beer's law – simultaneous determinations- spectrophotometers.

EXPERIMENTAL:

1. Preparation and standardization of 0.1 M HCl
2. Alkalinity determination
3. Preparation and standardization of AgNO_3 solution
4. Gravimetric determination of sulphate as BaSO_4
5. Spectrophotometric determination of the pK value of an indicator
6. Potentiometric titration of I^- and Cl^- and determination of solubility products
7. Potentiometric titration of acid mixture with strong base
8. Conductometric titration of acid mixture with strong base
9. Chloride determination in water with Volhard method
10. Determination of total and permanent hardness in water; calcium and magnesium determination
11. Iodometric titration of Vit. C
12. Potentiometric determination of fluoride ion
13. Spectrophotometric determination of the formation constant of the complex $\text{Fe}(\text{SCN})^{2+}$
14. Simultaneous spectrophotometric determination of Ti(IV) and V(V) with MLRA method.
15. Polarographic analysis

D.C. Harris, Quantitative Chemical analysis.