Code: QA282

Name: Química Clássica

Name in English: Classical Chemistry

Name in Spanish: Química Clásica

Subject type: Weekly

Approval Type: Grade and frequency

Characteristic: Regular

Frequency: 75%

Period Type / Offering period: Semi-annual / Every period

Requires Final Exam: Yes

Vectors

| T | L | P | O | PE | OE | SL | WEEKS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| **4** | **4** | **0** | **0** | **0** | **0** | **8** | **15** | **8** |

Occurrence on curriculum: 05, 50, 56, 63

Pre requirement: QG108 + QG109

**Summary:**
Ionic equilibrium, acid-base, complex ions, oxidation and reduction. Solubility and solubility product. Qualitative and quantitative analyses. Volumetry. Gravimetry. Expression of analytical results.

**Program**:

**THEORY:** General aspects of qualitative and quantitative analyses. Significant figures, accuracy and precision. Physical characteristics of precipitates. Precipitates contamination. Gravimetric analysis: conventional precipitation and from homogeneous solution. Chemical equilibria. Electrolyte effect on the chemical equilibria. Solubility products. Fractional precipitation. Volumetric analysis: general principles, applications and reactions. Volumetry of precipitation: indicators, Mohr´s method, Volhard´s method, Fajans´ method and titration curves. Acid-base equilibria. Buffer solution. Neutralization volumetry: indicators, acid and bases titrations, polyprotic acids and titration curves. Oxidation-reduction reactions. Balancing. Electrochemical cells. Salt bridge. Electrode potential. Nernst equation. Most used applications and reactions in redox titration. Redox volumetry: indicators, direct and indirect titrations, titration curves. Permanganometry. Iodometry. Dichromatometry. Complex-Formation equilibria. EDTA. Applications. Complex-Formation volumetry: indicators, effects of pH, buffers usage, interference in titrations with EDTA, masking agents and titration curves.

**EXPERIMENTAL:** Laboratory techniques. Solutions preparation. Stoichiometry. Anions and cations identification reactions: $Cl^-$, $SO_4^{2-}$, $NO_3^-$, $CO_3^{2-}$ and $NH_4^+$. Pipette calibration. Gravimetric analysis by precipitation from homogeneous solution. Volumetric precipitation: Mohr´s and Fajans´ methods and samples analysis. Buffer solutions and buffer capacity. Neutralization volumetry: preparation and standardization of NaOH and HCl solutions. Indicators test and samples analysis. Spreadsheets: species distribution. Redox volumetry: permanganometry and iodometry. Preparation and standardization of $KMnO_4$ and $Na_2S_2O_3$ solutions. Samples analysis. Complex-Formation equilibrium: reactions of ions in aqueous medium. Complex-Formation volumetry: EDTA solution preparation. Determination of $Cu^{2+}$ and $Zn^{2+}$ in brass. Masking agents.

**Basic Bibliography**

1) SKOOG, D.A.; WEST, D.M.; HOLLER, F.J.; CROUCH, S.R. **Fundamentos de Química Analítica**. tradução da 9. Ed. São Paulo: Cengage Learning, 2015. 950 p.
2) HARRIS, D.C. **Análise Química Quantitativa**. 9. Ed. Rio de Janeiro: LTC, 2017. 774 p.
3) BACCAN, N.; DE ANDRADE, J.C.; GODINHO, O.E.S.; BARONE, J.S. **Química Analítica Quantitativa Elementar**. 3. Ed. São Paulo: Edgard Blücher, 2001. 308 p.

**Supplementary Bibliography**

1) BACCAN, N.; GODINHO, O.E.S.; ALEIXO, L.M.; STEIN; E. **Introdução a Semimicroanálise Qualitativa**. 7. Ed. Campinas: UNICAMP, 1997. 295 p.
2) VOGEL, A.I. **Química Analítica Qualitativa**. 5. Ed. São Paulo: Mestre Jou, 1981. 665 p.

3) DANZER, K. **Analytical Chemistry: Theoretical and Metrological Fundamentals**. Berlin: Springer, 2007. XXXII, 316. E-book
4) KOCH, I.V.; ELIAS, V.M. **Ler e escrever: estratégias de produção textual**. São Paulo: Contexto, 2009. 220 p.
5) BAGNO, M. **A norma oculta – língua e poder na sociedade brasileira**. São Paulo: Parábola Editorial, 2003. 199 p.