UNIVERSIDADE ESTADUAL DE CAMPINAS
INSTITUTO DE QUÍMICA

PROGRAMS AND BIBLIOGRAPHY

Subject	
Code	**Name**
QA213	Chemistry II (Food Engineering)

Vector
OF:S-5 T:002 P:000 L:004 O:000 D:000 HS:006 SL:006 C:006 AV:N EX:S FM:75%

Pre requirement	QG101/ QG109

Summary

Introduction to the qualitative analysis.Equilibrium phenomena.General techniques of qualitative analysis.Separation and classification of cations and anions.Introduction to the quantitative analysis.Sampling.Treatment of the analytical data.General techniques of quantitative analysis.Gravimetry.Volumetry.

Program

THEORY

General aspects of qualitative and of quantitative analysis.Qualitative analysis. Statistics in analytical chemistry: significant figures, errors, propagation of the errors, data treatment, rejection of results and significance tests. Chemical equilibria.Buffer solutions.Volumetric analysis.General principles, applications, reactions.Volumetry of neutralization.Indicators.Titration of acids and bases.Polyprotic acids. Titration curves. Redox reactions.Balancing of chemical equations.Piles and galvanic cells.Salt bridges.Electrode potential.Equation of Nernst. Reactions more frequently applied in redox volumetry. Redox volumetry.Indicators.Direct and indirect titrations. Titration curves. Permanganometry.Iodometry.Dichrometry.Equilibria of complexation.EDTA.Applications.Volumetry of complexation.Indicators.pH effects.Uses of buffers.Interferences in titrations with EDTA.Masking agents. Titration curves. Solubility product.Fractional precipitation.Volumetry of precipitation.Indicators.Method of Mohr.Method of Volhard.Method of Fajans. Titration curves. Physical nature of the precipitates.Contamination of the precipitates. Gravimetric analysis: conventional precipitation and precipitation through homogeneous solution.

EXPERIMENTAL

Reactions of identification and separation of the cations of the group I. Identification reactions and separation of the cations of the group II.Reactions of identification of the anions Cl^- , SO_4^{2-}, NO_3^-, NO_2^-, CO_3^{2-}.Separation and identification of cations of the groups I and II and of anions (soda extract).Calibration of a volumetric pipette.Volumetry of neutralization: preparing and standardization of a NaOH solution. Test of indicators.

Determination of HCl and of acetic acid.Volumetry of neutralization: preparing and standardization of aHCl solution. Test of indicators. Determination of NaOH and of NH_3. Volumetric analysis – redox titration: permanganometry. Preparing and standardization of a $KMNO_4$ solution.Commercial hydrogen peroxide analysis.Volumetric analysis – redox titration:iodometry. Preparing and standardization of a $Na_2S_2O_3$ solution.Determination of free chlorine in a sodium hypochlorite solution (liquid bleach).Volumetric analysis – redox titration:dicromatometry. Preparation of a solution of $K_2Cr_2O_7$.Determination of iron in pharmaceuticals.Volumetry of complexation: preparing of an EDTA solution. Determination of Ca^{2+}.Study of interferents.Volumetry of precipitation: methods of Mohr and of Volhard. Determination of chloride. Gravimetric determination of lead an homogeneous precipitation system. Gravimetric determination of Nickel with dimethylglyoxime.

Bibliography

1. Baccan, N.; Godinho, O.E.S.; Aleixo O.E.S; e Stein, E., *Introdução a Semimicroanálise Qualitativa*, 7a edição, Editora UNICAMP, Campinas, 1997.
2. Baccan, N.; de Andrade, J.C.; Godinho, O.E.S.; Barone, J.S., *Química Analítica Quantitativa Elementar*, 3a edição (3a reimpressão), Editora Edgard Blücher, São Paulo, 2005.
3. Skoog, D.A.; West, D.M.; Holler F.J.; Crouch, S.R., *Fundamentos de Química Analítica*, Tradução da 8a edição Norte-Americana, Thomson Learning, São Paulo, 2006.
4. Harris, D.C., *Análise Química Quantitativa*, 6a Edição, LTC Editora, Rio de Janeiro, RJ, 2005

Evaluation criteria

For grading policy, see: Regimento Geral de Graduação, Seção I – Normas Gerais, Capítulo V – Da Avaliação do Aluno na Disciplina. Students are required to attend 75 % of the lectures. For further details, see: Regimento Geral de Graduação, capítulo VI, seção X, artigo 72.