**Analytical Chemistry practical lessons plan**

**2024/25**

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| № | Date | Name of topics and their summary | Hours |
|  |  | **III semester** |  |
| 1 | 6.09 | Classification of methods of redox titration. Conditions for redox titration. Reaction requirements. Permanganometric titration. The essence of the method. condition for the titration. Titrant. Its preparation, standardization. Establishing the end point of the titration. Application of permanganatometry in pharmaceutical analysis. Interview. Problem solving. Determination of the mass of iron (II) in solution. | 4 |
| 2 | 13.09 | Dichromatometric, ∙ iodimetric and iodometric titration. Essence of methods. Titrants, their preparation. Determination of the end point of the titration. Application in pharmaceutical analysis. Interview. Problem solving. Determination of the mass of copper (II) in solution. | 4 |
| 3 | 20.09 | Redox titration indicators. Classification of indicators. Redox indicators (reversible and irreversible), indicator color change interval. Examples of redox indicators often used in analysis (diphenylamine, 1,1-phenylanthranilic acid, ferroin, etc.). Curves of redox titration: calculation, construction, analysis. The choice of indicator based on the analysis of the titration curve. Iodatometric, iodochlormetric, ∙ bromometric and bromometric titration. Essence of methods. Titrants, their preparation. Determination of the end point of the titration. Application in pharmaceutical analysis. Interview. Problem solving. Determination of the mass fraction of ascorbic acid in the preparation. | 4 |
| 4 | 27.09 | Cerimetric and nitritometric titration. Essence of methods. Tit-rants, their preparation. Determination of the end point of the titration. Application in pharmaceutical analysis. Interview. Problem solving. Determination of the mass fraction of novocaine in the preparation. | 4 |
| 5 | 4.10 | Precipitation titration. response requirements. Titration curves, their calculation, construction, analysis. Influence of various factors on the titration jump (concentration of reagent solutions, precipitate solubility, etc.). Indicators of the method of precipitation titration: precipitation, metallochromic, adsorption. Application conditions and selection of adsorption indicators. Argentometric and thiocyanatometric titration. Titrants, their preparation, standardization. Varieties of methods of argentometry (method of Mohr, Fajans, Folgard). Essence of methods. Application in pharmaceutical analysis. Interview. Problem solving. Determination of the mass of potassium bromide in solution (Folhard method). | 4 |
| 6 | 11.10 | Compleximetric titration. Complexometry. Mercurymetry. Essence of methods. Indicators of complexometry (metallochromic indicators), the principle of their operation; requirements for metal-chromic indicators. Examples of metallochromic indicators (eriochrome black T, xylenol orange, etc.). Titrants of methods, their preparation, standardization. Application in pharmaceutical analysis. Interview. Problem solving. Determination of the mass of zinc in solution by comptexonometric titration. | 4 |
| 7 | 18.10 | **Educational and research work of a student** | 5 |
| 8 | 25.10 | **Control № 5.** | 4 |
| 9 | 1.11 | Instrumental methods of analysis. Optical methods of analysis. Classification of optical methods. Refractometric method of analysis. Theoretical foundations of the method. Types of refractometers. The refractive index and its dependence on various factors. Analysis of single and multicomponent systems. Interview. Problem solving. Quantitative analysis of concentrated solutions by refractometry. | 4 |
| 10 | 8.11 | Molecular spectral analysis in the ultraviolet and visible region of the spectrum. The essence of the method. Basic laws of light absorption: Bouguer-Lambert's law, Beer's law, combined Bouguer-Lambert-Beer's law of light absorption. Optical density and light transmission, the relationship between them. Absorption coefficient (k) and extinction coefficient - molar and specific; relationship between molar extinction ratio and absorption ratio. The concept of the origin of electronic absorption spectra: features of electronic absorption spectra of organic and inorganic compounds. Photocolorimetry, photoelectrocolorimetry: their essence, advantages and disadvantages, application. Spectrophotometry. The essence of the method, advantages and disadvantages, application. Interview. Problem solving. Photocolorimetric determination of copper (III) salt. | 4 |
| 11 | 15.11 | Qualitative and quantitative photometric analysis. Conditions for photometric determination (selection of photometric reaction, analytical wavelength, solution concentration and absorbing layer thickness, use of reference solution). Determination of analyte concentration: calibration curve method, one standard method, determination of concentration by molar and specific extinction coefficient, standard addition method. Determination of concentrations of several substances in their joint presence. Errors of photometric analysis, their nature, elimination. Interview. Problem solving. Spectrophotometric determination of the mass fraction of the medicinal substance. | 4 |
| 12 | 22.11 | Electrochemical methods of analysis. Classification of electrochemical methods of analysis. Potentiometric analysis. The principle of the method. Determination of the concentration of the analyte in direct potentiometry (calibration curve method, standard addition method). Application of direct potentiometry. Potentiometric titration. The essence of the method. Potentiometric titration curves (integral, differentiated, Gran's titration curves), application of potentiometric titration. Polarographic analysis. General concepts, the principle of the method. Polarographic curves, half-wave potential, relationship between the magnitude of the diffusion current and the concentration. Quantitative polarographic analysis, determination of the concentration of the analyte (calibration curve method, additive method, standard solution method). Amperometric titration. The essence of the method. Conditions for amperometric titration, amperometric titration curves, the concept of amperometric titration with two indicator electrodes. Determination of the mass of hydrochloric acid in solution by potentiometric titration. | 4 |
| 13 | 29.11 | Coulometric analysis. Method principles. Direct coulometry. Coulomb metric titration. The essence of the method. Conditions for carrying out coulometric titration. Equivalence point indication. Interviewing, problem solving. | 4 |
| 14 | 6.12 | Chromatographic methods of analysis. Ion exchange chromatography. The essence of the method. Ionites. ion exchange equilibrium. Methods of ion-exchange chromatography. Application of ion-exchange chromatography. Interviewing, problem solving. Determination of the mass of sodium chloride in solution by ion-exchange chromatography. | 4 |
| 15 | 13.12 | Gas (gas-liquid and gas-adsorption) chromatography. The essence of the method. High performance liquid chromatography. The concept of the theory of methods. Retention options. Separation parameters (degree of separation, separation factor, number of theoretical plates). Effect of temperature on separation. Methods for quantitative processing of the chromatogram (absolute calibration, internal normalization, internal standard). Interviewing, problem solving. Quantitative analysis of a medicinal substance by high performance liquid chromatography. | 4 |
| 16 | 20.12 | **Control № 6.** | 4 |
| 17 | 27.12 | **Final control** | 4 |