Instrumental analysis Assessment

Learning outcome	Method of assessment	Assessment criteria
Learning outcomes 2, 3, 4, 5, 7, 8. (2) knows the construction and principles of operation of pH-meter, ionomer; (3) knows the most usable methods of instrumental analysis of samples preparation; (4) can conduct independently instrumental analysis and handle the results of analysis; (5) is able to prepare standard solutions and compile calibration graphs on their basis; (7) is able to calibrate instrumental analysis equipment; (8) can execute computerized data handling by a spreadsheet calculation program and make conclusions on the basis of the results obtained.	**Practical tests 1- 5.** Potentiometry. Direct potentiometry and potentiometric titration. NO_3^- concentration determination. NH_4^+ concentration determination. Neutralization titration. Mild alkali concentration determination in titration by hydrochloric acid. Precipitation titration. Sodium chloride argentometric determination. Redox method. Permanganometry. H_2O_2 permanganometric determination.	**Passed.** Protocols of the works have been drawn up. The works have been defended. Homeworks have been solved.
Learning outcomes 2, 3, 4, 5, 7, 8. (2) knows the construction and principles of operation of conductometer; (3) knows the most usable methods of instrumental analysis of samples preparation; (4) can conduct independently instrumental analysis and handle the results of analysis; (5) is able to prepare standard solutions and compile calibration graphs on their basis; (7) is able to calibrate instrumental analysis equipment;	**Practical tests 6-8**. Conductometry. Conductometric titration. H_2SO_4 and $CuSO_4$ mixture quantitative analysis. HCl ja CH_3COOH mixture quantitative analysis. Na_2CO_3 and NaOH mixture quantitative analysis.	**Passed.** Protocols of the works have been drawn up. The works have been defended. Homeworks have been solved.

(8) can execute computerized data handling by a spreadsheet calculation program and make conclusions on the basis of the results obtained.		
Learning outcomes 2, 3, 4, 5, 6, 7, 8. (2) knows the construction and principles of operation of spectrophotometer; (3) knows the most usable methods of instrumental analysis of samples preparation; (4) can conduct independently instrumental analysis and handle the results of analysis; (5) is able to prepare standard solutions and compile calibration graphs on their basis; (6) can carry out preparation of a sample for instrumental analysis; (7) is able to calibrate instrumental analysis equipment; (8) can execute computerized data handling by a spreadsheet calculation program and make conclusions on the basis of the results obtained.	**Practical tests 9-11**. Spectrophotometry. Cations Fe^{3+}, Cu^{2+}, Ni^{2+} quantitative analysis in water solution.	**Passed.** Protocols of the works have been drawn up. The works have been defended. Homeworks have been solved.
Learning outcomes 2, 4, 5, 6. (2) knows the construction and principles of operation of refractometer; (4) can conduct independently instrumental analysis and handle the results of analysis; (5) is able to prepare standard solutions and compile calibration graphs on their basis; (6) can carry preparation of a sample for instrumental analysis.	**Practical tests 12-13**. Refractometry. Water content determination in seed oils. Two organic liquid mixture composition determination.	**Passed.** Protocols of the works have been drawn up. The works have been defended. Homeworks have been solved.

Learning outcomes 2, 4, 6. (2) knows the construction and principles of operation Of chromatograph; (4) can conduct independently instrumental analysis and handle the results of analysis; (6) can carry out preparation of a sample for instrumental analysis.	**Practical test 14**. Chromatography. Water mixtures gas chromatographic separation.	**Passed.** Protocols of the works have been drawn up. The works have been defended. Homeworks have been solved.
Learning outcome 4. (4) can conduct independently instrumental analysis ar calculate the results of analysis.	**Practical test** on the theme: Infra-red spectroscopy.	**Passed.** The tasks have been solved correctly.
Learning outcome 1. (1) knows the concepts and applications of the following methods of analysis: potentiometry, spectrophotometry, conductometry, chromatography, refractometry, infra-red spectroskopy, flame-AAS, NMR.	**Presentation** on the theme specified by the lecturer**.** Presentation in MS PowerPoint or in another.	**Passed.** A student has made presentation and was able to answer at least to 3 questions relevant or the presentation.
Prelim pre-conditions: all laboratory works have been done, protocols have been formed and defended, presentation has been compiled and openly performed, homeworks have been solved.		