

ANALYTICAL CHEMISTRY I. (LABORATORY PRACTICE) IN 2019/20

Subject and general rules:

The classical quantitative analysis involves acid-base, redox, argentometric and complexometric titrations.

It is not allowed to miss any laboratory practices. If a student misses one lab practice (medical certification is needed), he/she has to participate at a make-up laboratory practice. If a student misses two lab practices even for any medical reasons, he/she has to retake the course next year.

Each week the laboratory session begins with a short test (not more than 15 minutes) based on the course material of that week and calculations connected to the titrations of that week.

Grading is based on two separate factors:

- the average grade of short tests written at the beginning of the lab sessions (an average grade of these must be at least 2.0 to avoid a "fail" final grade),
- the average grade of unknown samples at the lab sessions (an average of these must be at least 2.0 to avoid a "fail" final grade)

Students with 'fail' final course grade due to inadequate laboratory work have to retake the course next year. Students with 'fail' final course grade due to low test results can retake once a comprehensive test exam in the examination period.

Weekly schedule:

Week 1 (14th February)

1. Introduction to the Quantitative Analytical Chemistry Laboratory. Laboratory Safety Information.
2. Review of lab equipment.
3. Demonstration of an acid-base titration

Week 2 (21st February)

1. Preparation of $\sim 0.1 \text{ mol/dm}^3$ HCl titrant (250 cm^3). (in Manual: site 1, part *a*)
2. Determination of the exact concentration of the HCl titrant solution using KHCO_3 stock solution. (in Manual: site 1, part *b*)
3. Determination of **HgO** in a HgO-KCl mixture /**unknown sample**/ (in Manual: site 4)

Week 3 (28th February)

1. Preparation of $\sim 0.1 \text{ mol/dm}^3$ NaOH titrant by the Sørensen method (500 cm^3) and determination of its exact concentration. (in Manual: site 1, part *a* and *b*)
2. Determination of **oxalic acid** /**unknown sample**/ (in Manual: site 3)
3. Simultaneous determination of **sulfuric acid and boric acid** in a mixture /**unknown sample**/ (in Manual: site 3-4)
4. Preparation of 0.02 mol/dm^3 KMnO_4 titrant (250.0 cm^3). (in Manual: site 7, part *a*)

Week 4 (6th March)

1. Preparation of 0.05 mol/dm^3 $\text{Na}_2(\text{COO})_2$ solution (100.0 cm^3)
2. Determination of the exact concentration of the KMnO_4 titrant solution using $\text{Na}_2(\text{COO})_2$ stock solution. (in Manual: site 7, part *b*)

3. Determination of **ferrous oxalate /unknown sample/**. (in Manual: site 9)
4. Determination of **hydrogen peroxide /unknown sample/**. (in Manual: site 9)

Week 5 (13th, March)

1. Preparation of 0.02 mol/dm³ Na₂S₂O₃ titrant (250.0 cm³) and determination of its exact concentration using 0.003 mol/dm³ KIO₃ stock solution. (in Manual: site 10-11)
2. Determination of **copper(II) /unknown sample/**. (in Manual: site 11)
3. Determination of **iodide ion /unknown sample/**. (in Manual: site 11-12)

Week 6 (20th, March)

1. Preparation of 0.02 mol/dm³ KBrO₃ titrant (250.0 cm³). (in Manual: site 9-10)
2. Determination of **ascorbic acid** active ingredient content of vitamin C tablet **/unknown sample/** (in Manual: site 10)
3. Preparation of 0.05 mol/dm³ AgNO₃ titrant (250.0 cm³). (in Manual: site 15)
4. Argentometric determination of the composition of a **NaCl-KBr** mixture **/unknown sample/**. (in Manual: site 15)

Week 7 (27th March)

1. Preparation of 0.01 mol/dm³ Na₂EDTA titrant solution (250.0 cm³). (in Manual: site 16)
2. Simultaneous determination of **Ca²⁺ and Mg²⁺ ions /unknown sample/**. (in Manual: site 16)
3. Determination of **Al(III) /unknown sample/**. (in Manual: site 17)
4. Lab equipment return