

## TTKBG0101\_EN - GENERAL CHEMISTRY (SEMINAR)

The seminars will be organized in the Chemistry Building, according to the following schedule:

Duration: *2x2 hours/week*

**Group A:** Monday 14:00 – 16:00 (Room D302) and Thursday 08:00 – 10:00 (Room D302)

Instructor: **Dr. Attila Forgács**, Department of Inorganic and Analytical Chemistry, Room D-503, e-mail: [forgacs.attila@science.unideb.hu](mailto:forgacs.attila@science.unideb.hu)

**Group B:** Monday 16:00 – 18:00 (Room E103) and Thursday 8:00 – 10:00 (Room K/6)

Instructor: **Ferenc Najóczki**, Department of Inorganic and Analytical Chemistry, Room D-503, e-mail: [najoczki.ferenc@science.unideb.hu](mailto:najoczki.ferenc@science.unideb.hu)

**Group C:** Wednesday 8:00 – 10:00 (Room D302) and Friday 12:00 – 14:00 (Room E213)

Instructor: **Dr. István Timári**, Department of Inorganic and Analytical Chemistry, Room E-19, e-mail: [timari.istvan@science.unideb.hu](mailto:timari.istvan@science.unideb.hu)

### **Subject and general rules:**

The main objective of the seminar is to give the basic knowledge and background for students to solve general calculation problems strictly connected to the general chemistry laboratory practice: calculations connected to mass and volume measurements, concentration and its units, crystallization, acid-base and redox equilibria, balancing chemical equations.

It is not allowed to miss any seminars. If a student misses two seminars even for any medical reasons, the student's lecture book won't be signed and she or he has to retake the course next year.

### **Requirements:**

The attendance to the seminar is compulsory, which is checked at every seminar. Two seminar session can be missed in the semester. However, if a student misses three sessions even for certified reasons, the student will automatically fail the course with a '*signature denied*' final mark.

Students are required to write two general tests (after week 6 and after week 11) which are based on the course material for weeks 1-5 and 7-11, respectively. Each general test is worth 50 points. Grading is based on a five-level scale: 1 (fail), 2 (pass), 3 (average), 4 (good), 5 (excellent). The final course grade is given based on the results of these tests. The score from

the general tests must be above 40 % to avoid a 'fail' final course grade. In order to pass the seminar, a student should collect minimum 40 points from the general tests. Students with 'fail' final course grade due to low test results can re-take once a comprehensive test exam in the examination period. However, if the student cannot pass this test, his or her exam result is a fail mark (1) for General Chemistry Seminar.

### **Supporting materials:**

For each seminar, supporting material (including the Syllabus and calculation problems) can be downloaded from the website of the Department of Inorganic and Analytical Chemistry (<http://inorg.unideb.hu>). First, click on the heading to the left: "OKTATÁS". Second, log in under the brown heading: "Bejelentkezés". You should give the "Felhasználónév" (username): analitika09. There is no password, just click on the button: "Belépés". In the list of the subjects under "OKTATÁS" look for: TTKBG0101\_EN General Chemistry (Seminar).

### **Don't forget to bring scientific calculator to the seminars.**

**Schedule:** The seminar will be held in 11 weeks.

#### *1<sup>st</sup> week*

Determination of atomic weight, molecular weight, empirical formula, molecular formula, amount of substance. Determination of empirical formula based on weight percent composition and on elemental analysis.

#### *2<sup>nd</sup> week*

General introduction to the units of concentration. Interconversion of units. Calculation problems connected to solution preparation. Introduction of the SI system. Mass concentration, molarity, mass percent composition, molar percent composition.

#### *3<sup>rd</sup> week*

Review exercises concerning on the first two weeks. Interconversion of concentration units. Density measurements. Mixing equations. Theoretical background of crystallization. Exercises calculation problems of crystallization.

#### *4<sup>th</sup> week*

Theoretical backgrounds of gas and solids. Composition of solid and gas mixtures. Introduction to basic chemical equations. Stoichiometric calculations based on chemical equations. Preparation of salts, calculation of theoretical and percent yield. Dissolving of metal mixtures in acids.

*5<sup>th</sup> week*

Acid-base equilibria. Theory of acid-base reactions and titrations. Exercises based on acid-base titrations. Stoichiometric calculations based on chemical equations. Determination of molar weight based on titration results.

*6<sup>th</sup> week*

Review exercises in stoichiometry and concentration calculations.

*7<sup>th</sup> week*

Introduction to basic gas laws. Laboratory preparation of gases. Calculation problems connected to evolution of gases based on chemical equations.

*8<sup>th</sup> week*

Theory of redox reactions. Balancing of redox reactions. Calculations based on redox reactions. Preparation of salts from its metal. Review exercises in balancing of redox and acid-base reactions.

*9<sup>th</sup> week*

Definition of pH. Theoretical background of pH calculation. Introduction to water ionisation constants. Relationship between the  $K_w$  and  $H^+$ . Calculation of pH of strong acids and strong bases.

*10<sup>th</sup> week*

Calculation of pH of weak acids and weak bases. Determination of dissociation rate. Theoretical background of buffer systems, buffer capacity. Calculation problems regarding the pH of buffer systems.

*11<sup>th</sup> week*

Electrochemical exercises. Fundamental of galvanic cells (Daniell cell). The concept of electromotive force, redox potential, standard redox potential. Nernst equation. Review exercises of pH calculations.