

2023/2024. ACADEMIC YEAR							
PROGRAM OF STUDY (FOR STUDENTS OF 1ST YEAR)							
Full (Hun) name of the subject: ÁLTALÁNOS ÉS SZERVETLEN KÉMIA I.							
Program: Undivided program (pharmaceutical)							
Schedule: full-time							
Short name of the subject: Ált. kém.							
English name of the subject: General and Inorganic Chemistry I.							
German name of the subject: Allgemeine und Anorganische Chemie I							
Type of registration: <u>obligatory</u> /obligatory elective/elective/criteria requirement							
Neptun code of the subject: GYKGYK320E1A							
Responsible Department: Department Of Pharmaceutical Chemistry							
Responsible tutor				Title, academic degree:			
Contact information: - phone: - email:							
Name of the persons responsible for the teaching of the subject:				Title, academic degree:			
Class per week: 3 hours lecture 4 hours practices				Credit point(s): 7 credits			
Professional content, intent of acquirement and it's function in order to implement the goals of the program: Understanding the fundamental concepts of chemistry and acquiring basic laboratory skills.							
Short description of the subject: Fundamentals of atomic structure. Elementary particles. The Bohr model of the atom. Dual nature of electron. Heisenberg uncertainty principle. Schrödinger's equation and quantum numbers. Pauli's exclusion principle and Hund's rule. Energy levels of orbitals and order of filling orbitals. The structure and properties of the Periodic Table of Elements. Periodic properties. Ionic bond. Covalent bond. Depicting covalent bonds with Lewis structures. Octet rule. Valence shell electron pair repulsion (VSEPR) theory. Geometry of molecules based on VSEPR theory. Creation of molecular orbitals. Polarity of bonds and molecules. Magnetic properties. Electronegativity and its determination. Metallic bond. Weak bonds. Types of chemical reactions. Stoichiometry. Phases of matter. Phase diagram and the phase law. Mixtures, solutions. Laws of dilute solutions. Acid-base theories. Electrode processes. Galvanic cells. Direction of redox reactions, redox potential. Chemical equilibria. Law of mass action. pH and its calculation. Salt hydrolysis. Buffer systems. Complexation equilibria. The Pearson concept of Lewis acid-base theory. Chemical kinetics. Reaction order and molecularity. Reaction mechanisms. Catalysts, homogeneous and heterogeneous catalysis. Autocatalytic, induced and oscillating chemical reactions. Fundamentals of thermochemistry. Specific heat, heat capacity, endo- and exothermic reactions. Hess's law. Internal energy and enthalpy change of chemical reactions. Entropy.							
Course data							
Recommended term	Contact hours (lecture)	Contact hours (practice)	Contact hours (seminar)	Individual lectures	Total number of contact hours/semester	Normal course offer	Consultations
1 st semester	42	56	-	-	98	<u>Autumn semester*</u> Spring semester Both semesters (* Please underline)	-

Program of semester**

Topics of theoretical classes (pro week):

1. Introduction. Phases of matter, phase changes, Gibbs's rule of phase change. Physical methods of purification: sublimation, crystallization, distillation, ideal/non-ideal mixtures, azeotropy. Distillation of real mixtures. Partition equilibria, liquid-liquid extraction. Deionization and other water purification methods.
2. Chemical equilibria, law of mass action. Relationship between equilibrium constants expressed with concentration and pressure. Le Chatelier-Braun principle. Temperature and pressure dependence of equilibria. Acid-base equilibria.
3. Arrhenius acid-base theory, Brønsted-Lowry acid-base theory. Conjugate acid-base pairs and relationships between certain equilibrium constants. Acid-base equilibria of water.
4. Basics of atomic models, electron, proton, neutron. The determination of the charge of electron. The Bohr model of atoms. Dual nature of electron: particle and wave. Heisenberg's uncertainty principle. Schrödinger's equation and quantum numbers. Pauli's exclusion principle and Hund's rule. Energies of atomic orbitals and their order of filling.
5. 1st major test, redox reactions (introduction)
6. Redox reactions, direction of redox reactions.
(retake of 1st major test; in separate time)
7. Electrode processes: galvanic cells and electrolysis.
8. The blocks of the Periodic Table of Elements and its properties. Periodic properties: atomic radius, ionic radius, ionization potential, electron affinity. Ionic bonds and types of ions. Determination of electronegativity. Metallic bond.
9. 2nd major test, covalent bond and its depiction with Lewis structures.
10. The drawbacks of Lewis structures. Exceptions to the octet rule. Valency bond theory. Hybridization of atomic orbitals. Molecular geometry by VSEPR theory. Creation of molecular orbitals, examples. Polarity of bonds and molecules. Weak intermolecular forces. Dispersion and dipole forces. Hydrogen bond.
(retake of 2nd major test; in separate time)
11. pH and its calculation. Strength of acids and bases. Salt hydrolysis. Buffers. Laws of dilute solutions.
12. Complexation equilibria. Types of ligands. Equations of conservation of mass, calculation of complexation equilibria.
13. 3rd major test, heterogeneous equilibria (introduction)
14. Heterogeneous equilibria II., solubility constants, solubility.
(retake of 3rd major test; retake of retakes, in separate time)

Topics of practical classes (pro week):

1. Introduction to the topics and requirements of the course. Fire and safety training. Nomenclature of inorganic compounds. Examination of osmotic pressure with precipitates (177.).
2. Nomenclature of compounds. Calculation of concentrations: preparation of solutions, mixing, dilution. Crystallization of alum (47.). Sublimation of iodine (55.).
3. Calculations related to crystallization, basics of stoichiometry. Purification of hydrochloric acid with distillation (52.). Preparation of copper(II)-sulfate (78.).
4. Stoichiometric calculations, laws of gases. Practice. Preparation of borax acid from borax(79.). Deionization of water (58.). Solution of sample test
5. Hydrolysis. Redox reactions I. Observation of hydrolysis of some salts (85.). Preparation of calcium hydrogen phosphate (89.).
6. Redox reactions II. The order of redox potentials and its governing laws (129.). Observation of some redox reactions (130.).
7. Observation of some redox reactions (130.) continued. Determination of the mass of a piece of Mg from the volume of H₂ gas produced (132.).
8. Preparation and examination of galvanic cells (155.). Experiments regarding electrolysis (157.). „Chemical vulcano”: thermal decomposition of ammonium dichromate (195.). Preparation of iron(II) sulfate (144.). Solution of sample test
9. Temperature and concentration dependence of reaction rate (200.). Catalysis: decomposition of hydrogen peroxide (201.). Oscillating reactions (202.).
10. pH calculation I. Preparation of copper(I) oxide (145.). Preparation and reactions of copper metal (140.) and manganese (141.).
11. pH calculation II. Thermal decomposition. Observation of the decomposition of inorganic compounds (194.). Buffer solutions and buffer capacity (107.).
12. Complex compounds, Preparation of [tetraamine-copper(II)] sulfate (165.). Preparation of cobalt(II)- [tetrakis(thiocyanato)-mercury(II)] (167.) Solution of sample test
13. Concepts related to the solubility constant (171.) Comparison of solubility constants (178.) Preparation of precipitated sulfur (149.). Preparation of Mohr's salt (181.).
14. Supplementary practical.

Other subjects (both compulsory and optional) relating to the transversal issues of the subject. Possible overlaps between subjects:

The General and Inorganic Chemistry I course discusses the basics of chemistry from the ground up.

The lectures and practices of this course touch upon some areas of physical chemistry (electrochemistry, order of chemical reactions, reaction kinetics, thermodynamics, etc.). These topics are discussed in detail in other courses (Biophysics, Physical Chemistry).

Schedule of consultations: at the request of students
Course requirements
Prerequisites: -
<p>Conditions of attending the classes, amount of acceptable absents, way of presentation of leave, opportunity for makeup:</p> <p>Students must be <u>present at minimum of 75% of</u> the total number of <u>laboratory practices</u> scheduled during the semester (i.e. a maximum of 3 absences is allowed). Timeliness is mandatory. Arriving more than 15 minutes late will be considered equivalent to absence from the laboratory practice. Arriving up to 15 minutes late to a practice will be considered "late" and 3 late practices amount to an absence.</p> <p><u>All exercises and measurements</u> listed in the schedule must be completed before the end of semester. A make up ("supplementary lab") to complete the measurements labs missed will be provided during the semester; and at the end of the semester for justified cases.</p>
<p>The grading method; the conditions for getting the signature; the number, topic(s) and date(s) of the mid-term assessments, (reports, term tests), and the process in which they contribute to the final grade; and the possibility of their retake or their upgrading retake (as provided in §§ 25-28 of the STUDY AND EXAMINATION REGULATIONS):</p> <p>In order to assess the mastery of the theoretical curriculum 3 major test-papers will be written during lecture hours on separate occasions which will be agreed upon mutually with the students (see list of lectures). All written tests and oral answers will be evaluated according to a five-scale grading system. <u>Minimum of 50% of the total score is required for earning a passing mark (satisfactory, 2)</u> on the tests.</p> <p>2 opportunities to correct/make-up the marks of each major test (retake) will be provided during the semester.</p> <p>The mean of the 3 test results (or the retake result thereof) will account for 50% of the semi-final mark (see Examination requirements).</p>
<p>Requirements of signature(as provided for in STUDY AND EXAMINATION REGULATIONS § 29):</p> <p>Acquiring the semester-end signature has theory and practice requirements as well.</p> <p>Theory requirement:</p> <p>At least satisfactory (2) mark achieved on all the major test-papers (or retake test thereof).</p> <p>Practice requirement:</p> <p>The student has accomplished all goals defined for the laboratory practices as in the topic list and the number of absences does not exceed the allowed limit.</p> <p>A student is allowed to take the semester-end examination if they have acquired the signature for the semester.</p>
<p>Number and type of projects students have to perform independently during the semester and their deadlines:</p> <p>A <u>written report</u> must be prepared upon the completion of each laboratory exercise which must be presented for evaluation to the supervising teacher within a week after completion of the exercises. The lab report must contain the date of the lab practice, title and short description of the task, in case of a new method a schematic representation of the device, all relevant balanced chemical equations and calculations. The format of the lab report will be determined by the supervising teacher, both handwritten and electronic formats may be acceptable.</p>

<p>Type of the semester-end examination: signature*/practical grade*/ <u>comprehensive examination</u>*/final/end-term examination*</p> <p>Examination requirements: as published by the education-research department on the MOODLE interface by the start of the academic term.</p> <p>The semester-end mark consists of 2 parts:</p> <ol style="list-style-type: none"> (1) The mean of the 3 test results (or the retake result thereof) (50%); (2) The mark achieved on the semi-final oral exam (50%). <p style="padding-left: 40px;">The topic list for the semi-final oral exam will be published on the MOODLE website of the department til the beginning of the semester.</p> <p>For a successful semester-end examination both the above parts must be achieved with at least a satisfactory (2) mark.</p>
<p>Form of the semester-end examination: written*/<u>oral</u>*/combined examination/practical examination/the assessment of completing project work (according to STUDY AND EXAMINATION REGULATIONS 30.§)* (<i>Please underline</i>)</p>
<p>The possibility and conditions for offering grades:</p> <p>-</p>
<p>A list of the basic notes, textbooks, resources and literature that can be used to acquire the knowledge necessary to master the curriculum and to complete the assessments, <u>***</u> with exact description about which of them is required to acquire which part of the syllabus (e.g. description based on topics)), as well as the main technical and other aids and study aids that can be used:</p> <p>lecture notes</p>
<p>In the case of a subject lasting more than one semester, the position of the teaching/research department on the possibility of parallel enrolment and the conditions for admission****:</p> <p>yes*/<u>no</u>*/on and individual assesment basis* (<i>Please underline</i>)</p>
<p>The course description was prepared by:: Dr. György Tibor Balogh, Dr. Tamás Pála</p>