<table>
<tr><th colspan="2">2024/2025. ACADEMIC YEAR
PROGRAM OF STUDY (FOR STUDENTS OF 1ST YEAR)</th></tr>
<tr><td colspan="2">Full (Hun) name of the subject: Általános kémia</td></tr>
<tr><td colspan="2">Program: Undivided program (pharmaceutical)</td></tr>
<tr><td colspan="2">Schedule: full-time</td></tr>
<tr><td colspan="2">Short name of the subject: Ált. kém.</td></tr>
<tr><td colspan="2">English name of the subject: General Chemistry</td></tr>
<tr><td colspan="2">German name of the subject: Allgemeine Chemie</td></tr>
<tr><td colspan="2">Type of registration: obligatory/obligatory elective/elective/criteria requirement</td></tr>
<tr><td colspan="2">Neptun code of the subject: GYKGYK329E1A</td></tr>
<tr><td colspan="2">Responsibnle Department: Department of Pharmaceutical Chemistry</td></tr>
<tr><td>Responsible tutor
Prof. Dr. Balogh György Tibor
Contact information:
Department of Pharmaceutical Chemistry, Semmelweis University
address: H-1092 Budapest, Hőgyes Endre u. 9.
phone: +36-1-217-0891
e-mail:
balogh.gyorgy.tibor@semmelweis.hu</td><td>Title, academic degree:
director, professor, DSc</td></tr>
<tr><td>Name of the persons responsible for the teaching of the subject:
Dr. György Tibor Balogh (theory)
Dr. István Szalai (theory)
Dr. Norbert Szoboszlai (theory, prac.)
Dr. Edina Kiss (prac.)
Dr. Krisztina Kovács (theory, prac.)
Dr. Tamás Pálla (theory, prac.)
Dr. István Molnár (prac.)
Dr. Arash Mirzahosseini (theory, prac.)
Dr. Ádám Golcs (theory, prac.)</td><td>Title, academic degree:

professor, DSc
professor, DSc
associate professor, PhD
research assistant, PhD
assistant professor, PhD
assistant professor, PhD
research assistant, PhD
assistant professor, PhD
assistant professor, PhD</td></tr>
<tr><td>Class per week:
2 lectures
4 practices</td><td>Credit point(s):
6 credits</td></tr>
<tr><td colspan="2">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.</td></tr>
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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. Valance shell electron pair repulsion (VESPR) 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.

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**
1st semester	28	56	--	--	84	**Autumn semester*** Spring semester Both semesters *(* Please underline)*	--

Program of semester**

Topics of theoretical classes (pro week):

1. week (09. 4.): States of matter, phase changes and the most common purification methods. Purification of water.

2. week (09. 11.): Atomic structure: electron, proton, neutron. Determination of the charge of an electron.The Bohr model and its limitations. The dual behavior of the electron. The Heisenberg uncertainty principle. The Schrödinger equation and the quantum numbers. The Pauli exclusion principle and the Hund's rule. The order of electron filling in an atom.

3. week (09. 18.): The basic properties of the Periodic Table. Periodic properties: atomic radius ionic radius, ionization energy and electron affinity (Dr. Kovács, ELTE) Ionic bonding and the types of ions. The electronegativity and the ionic character of the covalent bonds. Bonding energy. Metallic bonding.

4. week (09. 25.): The covalent bonds and its representation in Lewis structures. Limitations of the Lewis structure and exceptions to the octet rule. Geometry of the molecules based on the VSEPR theory.

5. week (10. 02.): The valence-bond theory and the hybridization. The formation of molecular orbitals. Single and multiple covalent bonds, the bond polarity. Weak bondings.

6. week (10. 9.): Ideal and real gases. Introduction to redox reactions.

7. week (10. 16.): Redox reactions. Spontaneous redox processes. Redox reactions in practice.

8. week (10. 23.): Galvanic cell and electrolysis Faraday's laws.

9. week (10. 30.): Chemical equilibria and the factors affecting the chemical equilibrium. Law of mass action

10. week (11. 06.) Acid base theories, acid-base equilibria and the pH

11. week (11. 13.): pH calculations, strong and weak acids. The hydrolysis and the buffer systems. Colligative properties

12. week (11. 20.): Thermal decomposition of inorganic compounds. Complex formation I.

13. week (11. 27.): Complex formation II. Characterization of complexes.

14. week (12. 04.): Heterogeneous equilibria, solubility product, solubility, factors affecting the solubility.

Topics of practical classes (pro week):

1st week	4 Sept.	Grading requirements. General instructions, safety in laboratory. Opening inventory. Nomenclature of inorganic compounds. **Observation of osmosis (p. 159).**
2nd week	11 Sept.	*Short test I.* Problem solving: concentrations, mixing and diluting of solutions. **Recrystallization of alum (p. 63). Sublimation of iodine (p. 71).**
3rd week	18 Sept.	*Short test II.* Problem solving: basics of stoichiometry, acid-base reactions. **Purification of hydrochloric acid by distillation (p. 69)**. **Preparation of copper(II) sulfate (p. 93).**
4th week	25 Sept.	*Short test III* Problem solving: stoichiometry, gas laws. Preparation for the 1st Midterm. **Water purification using ion-exchange resins (p.72).**
5th week	2 Oct.	*Short Test IV.* Hydrolysis. Oxidation state of the elements. **Observation of hydrolysis of some salts (p. 96)**.
6th week	9 Oct.	*Short test V.* Balancing redox equations, standard potential. Experimental observation of redox reactions, direction of spontaneous change. **Observation of some oxidation-reduction reactions (p. 119).**
7th week	16 Oct.	*Short test VI.* Preparation for the 2nd Midterm. **Determination of mass of a magnesium sample (p. 144).** ***Demonstration: 'Chemical volcano': thermal decomposition of ammonium dichromate***
8th week	23 Oct.	*Holiday*
9th week	30 Oct.	*Short test VII.* Problem solving: pH calculations, Part I. **Preparation of copper(I) oxide** (**p. 128**). ***Demonstration: Preparation of metallic substances: manganese (p.123-124).***
10th week	6 Nov.	*Short test VIII.* Problem solving: pH calculations, Part II. **Preparation of metallic substances: copper (p.123-124). Preparation of precipitated sulfur.**
11th week	13 Nov.	*Short test IX.* Thermal decomposition, Problem solving: pH calculations, Part III. **Buffer solutions and buffer action (p. 145). Observation of thermal decomposition of inorganic substances (p. 102)**
12th week	20 Nov.	*Short test X.* Preparation for the 3rd Midterm. **Preparation of a coordination compound, [tetraammine copper(II)] sulfate (p. 139).**
13th week	27 Nov.	Solubility of precipitates. Solubility product. Compensatory lessons for Midterm writing
14th week	4 Dec.	Compensatory lessons for Midterm writing

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

The General Chemistry 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, etx.). These topics are discussed in detail in other courses (Biophysics, Physical Chemistry).

Schedule of consultations: at the request of students

Course requirements

Prerequisites: -

Conditions of attending the classes, amount of acceptable absents, way of presentation of leave, opportunity for makeup:

Students must be present at minimum of 75% of the total number of laboratory practices 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.

All exercises and measurements listed in the schedule must be completed before the end of semester. A make up ("supplementary lab") to complete the mesaurements labs missed will be provided during the semester; and at the end of the semester for justified cases.

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):

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. Minimum of 50% of the total score is required for earning a passing mark (satisfactory, 2) on the tests.

2 opportunities to correct/make-up the marks of each major test (retake) will be provided during the semester.

The mean of the 3 test results (or the retake result thereof) will accont for 50% of the semi-final mark (see **Examination requirements**).

Requirements of signature(as provided for in STUDY AND EXAMINATION REGULATIONS § 29):

Acquiring the semester-end signature has theory and practice requirements as well.

Theory requirement:

At least satisfactory (2) mark achieved on all the major test-papers (or retake test thereof).

Practice requirement:

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.

A student is allowed to take the semester-end examination if they have acquired the signature for the semester.

Number and type of projects students have to perform independently during the semester and their deadlines:

A written report 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.

Type of the semester-end examination: signature*/practical grade*/ **comprehensive examination***/final/end-term examination*

* Please underline

Examination requirements: (list of topics, test examination topics, mandatory parameters, diagrams, concepts, list of calculations, practical skills, and project tasks recognised as examinations, criteria for completion and assessment):

The semester-end mark consists of 2 parts:

- The mean of the 3 test results (or the retake result thereof) (50%);
- The mark achieved on the semi-final oral exam (50%).
  The topic list for the semi-final oral exam will be published on the MOODLE website of the department til the begining of the semester.

For a successful semester-end examination both the above parts must be achieved with at least a satisfactory (2) mark.

Form of the semester-end examination*:* written*/**oral***/combinated examination/**practical examination/the assessment of completing project work (according to STUDY AND EXAMINATION REGULATIONS 30.§)*** *(* Please underline)*

The possibility and conditions for offering grades:
-

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, ****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:

lecture notes

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**:**

yes*/**no***/on and individual assesment basis* *(* Please underline)*

The course description was prepared by:
Dr. György Tibor Balogh, Dr. Tamás Pálla

***** A tantárgy tematikáját oly módon kell meghatározni, hogy az lehetővé tegye más intézményben a kreditelismerési döntéshozatalt, tartalmazza a megszerzendő ismeretek, elsajátítandó alkalmazási (rész)készségek, (rész)kompetenciák és attitűdök leírását, reflektálva a szak képzési és kimeneti követelményeire.***