

## Technical Chemistry

Code: MK3MKEMK04GX17

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+1

Lecture: 2

Practice: 1

### Topics:

Basic definitions in chemistry: atoms, molecules, elements, compounds, mixtures, chemical symbols, chemical formulas, relative atomic and molecular mass, molar mass, the laws of definite and variable proportions, chemical equations, the classification of chemical reactions. Atoms and the atomic theory. Electron configurations and the periodic table. Chemical bonds. States of matter: ideal gases the gas laws. Avogadro's and Dalton's laws. The kinetic molecular theory of gases. Real gases and their behaviour, the van der Waals equation. A liquid state and its properties. A solid state and its properties. Units of concentration. Ideal and real solutions. Acids and bases. Chemical kinetics. The rate of a chemical reaction. Chemical technologies, modelling. The chemical basis of engineering materials such as cement, adhesives, polymers, fuels, metals and semiconductors.

### Literature:

Required:

- Tom Holme, Larry Brown: Chemistry for Engineering Student, Publisher: Brooks Cole, Hardcover: 653 pages, 2006, Paperback ISBN-10: 0534389740.

Recommended:

- [James O. Glanville](#): General Chemistry for Engineers, Preliminary Edition (Paperback) Paperback: 663 pages, Publisher: Prentice Hall; Prl edition, 2000, ISBN-13: 978-0130325143.
- [Darrell Ebbing](#), [Steven D. Gammon](#): General Chemistry (Hardcover) Publisher: Brooks Cole; 9 edition, 2007, 1030 pages ISBN-13: 978-06188574871.

Recommended textbook:

- John McMurry – Robert C. Fay: Chemistry 6th ed., Prentice Hall ISBN: 0321704959. Available in the MEDICINA bookstore in the theoretical building on the medical campus. Price: HUF 22,000.

### Schedule

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

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

**Lecture:** Sciences and chemistry, Quantitative laws in chemistry, basic concepts of stoichiometry

**Practice:**

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

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

**Lecture:** Characterization of macroscopic chemical systems, states of matter **Practice:**

#### 5<sup>th</sup> week:

**Lecture:** Solutions

**Practice:**

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

**Lecture:** Reaction rates

**Practice:**

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

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

**Lecture:** Acid-base equilibria, Heterogeneous equilibria

**Practice:**

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

**Lecture:** The structure of atoms and nucleus

**Practice:**

**13<sup>th</sup> week:**

**Lecture:** Principles of determination of a chemical structure

**Practice:**

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Practices in blocks!**

*Week 1 (2 hours)*

1. General rules of laboratory work and using of laboratory equipment
  - 1.1. Laboratory work and safety training
  - 1.2. Introduction to laboratory equipment

*Week 2 (6 hours)*

1. Determination of BOD (Biochemical Oxygen Demand) values for different water samples by OxiTop® IS 12 BOD measuring system (Starting of measurement).
2. Investigation of water samples by MultiLine P4 portable electroanalytical set

*Week 3 (6 hours)*

1. Determination of BOD (Biochemical Oxygen Demand) values for different water samples by OxiTop® IS 12 BOD measuring system (Finishing and evaluation of measurement).
2. Mass and volume measurement
  - 2.1. Introduction into the mass measurements with the overview of the metric and SI units and introduction into the concepts of precision and accuracy
  - 2.2. Introduction into the volume measurements with determination of hydrochloric acid solution's precise concentration by acid-base titration

**Lecture:** Thermochemistry

**Practice:**

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

**Lecture:** Equilibrium

**Practice:**

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

**Lecture:** Redox reactions

**Practice:**

**12<sup>th</sup> week:**

**Lecture:** Quantum mechanical model of the atom

The chemical bond

Structures and bonding in chemical systems

**Practice:**

**14<sup>th</sup> week:**

**Lecture:** Theoretical models of solid materials: band theory and its applications to metals. Superconductivity and its applications. Commercial methods of metal production.

**Practice:**

## Requirements

### A, for a signature and lab grade:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

The **Lab Manual** is available to the students at the webpage of Dr. Ildikó Bodnár, the head of the Department of Chemical and Environmental Engineering: (<http://www.eng.unideb.hu/kvt>)

The weekly syllabus covers the particular topics and gives a full description of the experiments.

Each week the laboratory session begins or closes with a short test (no more than 20 minutes) based exclusively on the preparatory material of that week and the previous week and the results of the experiments carried out the previous week. There are two short tests (2. and 3. week) during the semester. **Lab grading** is based on a five-level scale: 1 (fail), 2 (pass), 3 (average), 4 (good), 5 (excellent) calculated from as an average of the tests' results (the average of two short test) and measurement reports (the average of four measurement reports). The minimum requirement for the short tests is 50%.

### B, for a grade:

Test after the completion of the semester, no midterm tests, sample test questions provided on the website in the beginning of December.

Website: <http://www.inorg.unideb.hu/>

All lecture materials are posted at least one day before the lecture.

The grade for each test is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the score of any test is below 60, once students can take a retake test of the whole semester material.