UNIVERSITY OF PANNONIA

COURSE DATASHEET

Semester:	2016/17/1
Course:	Physical Chemistry I.
Code:	VEMKFKB212A
Responsible department:	Department of Physical Chemistry
Department code:	MKFK
Responsible instructor:	dr. Tamás Kristóf

Course objectives:

Teach basic knowledge of physical chemistry.

Course content:

An introduction to chemical thermodynamics. Definitions (wall, system, property). Extensive and intensive properties. Temperature. Equilibrium. Homogeneity. Components. Thermal energy. Internal energy. Work, volumetric work, cycles. Reversible work. Heat, reduced heat as entropy. The laws of thermodynamics. The first law. The second law. Irreversible processes. The 3rd law. Entropy-maximum and energy-minimum. Kinetic theory of gases. The Gibbs-equation. Definitions of intensive properties. Equality of empirical and thermodynamic temperature. The Euler equation. Conditions of thermal, mechanical and chemical equilibrium. Carnot-efficiency. Heat engines. Refrigerators. Thermodynamic reservoirs. Energy functions. Enthalpy. Free energy. Gibbs free energy. Intensive properties from the derivaties of H, F and G. Gibbs-Helmhotz- and Gibbs-Duhem-equations. Chemical potential. Thermodynamic relations. Maxwell-relations. Volumetric properties and heat capacities. Thermodynamic relations. U, H and S as functions of p, V and T. Changes in F, G. Thermochemistry: Hess-law, Kirchhoff-equation. Thermodynamic properties of perfect gases. Changes of state (isothermal, isobaric, isochoric, adiabatic). The Poisson-equation. w, q, U, H, S, F and G as functions of p, V and T in ideal gas. Intermolecular forces. Lennard-Jones-potential. Equations of state for real gases. Compression factor, van der Waals equation, virial equation. The corresponding states law. Properties of real gases. Fugacity. Joule-Thomson-effect. Condensed states. Pair-correlation function. Crystal structures. Madelung energy of ionic crystals. Crystal energy from Born-Haber cycles. Einstein-and Debye-heat capacity. Properties of liquids: viscosity, Hagen-Poiseuille law. Special structures: water, liquid crystals, glasses. Electric properties of materials. Dielectric polarization. Debye-equation of molar polarization. Dielectric relaxation. Magnetic properties. Langevin equation. Mixture and solution. Gaseous mixtures. Partial molar quantities. Ideal mixtures, deltaG, deltaS. The activity and the reference states. Relationships between different types of activities. Real mixtures, excess properties. Regular mixtures, athermic mixtures. Electrolyte solutions. Born equation. Debye-Hückel equation. Phase equilibria in one component systems. Phase law for one component systems. Liquid-vapour equilibrium. Saturated vapour, saturated liquid, ratio of vapour phase. Clausius-Clapeyron-equation, Antoine-equation. Phase diagrams. Phase diagrams for water and sulphur. The stability of the phase. First and second order phase changes.

Requirements, evaluation and grading:

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Requirements, evaluation and grading:

At the beginning the examination each student will receive input-questions that assess the student's knowledge of the basics of physical chemistry. Students passing all questions will receive an unconditional pass for the comprehensive exam.

Required and recommended readings:

Liszi, J.: Fizikai kémia, Veszprém, 1993. Kézirat.

Liszi, J., Ruff, I., Schiller, R., Varsányi, Gy.: Bevezetés a fizikai kémiába, Műszaki Könyvkiadó, Budapest, 1993.

Atkins,W.,P.: Fizikai Kémia I-III., Tankönyvkiadó, Budapest, 1990.