

FOUNDATION COURSE FPCH01

Chemistry - Lectures/Seminars

(17. 10. 2016 – 31. 3. 2017)

Week number	date	Lecture 2 + 2, Seminar 3
1	20.10.-21.10.	<p>Entrance test</p> <p>Classification of matter. Basic chemical terms– pure substances (elements and compounds), mixtures. Atoms and molecules. Subatomic particles, atomic and mass numbers. Isotopes and atomic mass. Relative atomic mass of an element, molecular mass of a compound.</p> <p>The amount of a substance, the mole of an element or a compound, Avogadro's constant. The molar mass of a compound, the molar volume of gases at standard temperature and pressure.</p>
2	27.10. 28.10. National Holiday	<p>Atomic structure, the electron configuration of elements. Rules of filling the orbitals. Electron arrangement for the first 20 elements.</p> <p>The Periodic table of elements. The periodicity of the properties of the elements. The positions of the representative elements in the table.</p>
3	3.-4.11.	<p>Chemical bonds. The octet rule. Single and multiple covalent bonds, coordinate covalent bond. Shapes of the molecules. Hybridization theory. Electronegativity and bond polarity. The polarity of molecules. Complex compounds.</p> <p>Ionic and molecular compounds. Formation of ions. Ionic charges from group number. Metallic bond. Names and formulas of ionic compounds.</p>
4	10.-11.11.	<p>Weak intermolecular bonding. Naming covalent compounds, writing formulas.</p>

		Stoichiometric calculations. Chemical equations, balancing equations, mass relations in chemical reactions. Progress test 1
5	17.-18.11. 17.11. National Holiday	Solutions - expressing the composition of solutions: mass fraction (percentage by mass), amount-of-substance concentration (molarity), and mass concentration, calculations. Solutions of nonelectrolytes and electrolytes, dissociation and ionization of electrolytes, strong and weak electrolytes. Concentrations of ions in solutions of strong electrolytes.
6	24.-25.11	Types of chemical reactions. Protolytic reactions. Strong acids and bases. Weak acids and bases, ionization constants. Ionization of water, the ionic product of water. pH value - calculations. Hydrolysis of ions
7	1.-2.12.	Oxidation-reduction reactions, oxidizing agents and reducing agents. Balancing redox equations. Half equations in redox reactions and the numbers of electrons lost or gained. Heats of reaction and other enthalpy changes. Hess's law. Reaction rate and factors that influence reaction rates. Chemical equilibrium, equilibrium constants.
8	8.-9.12.	Hydrogen and oxygen, properties, ionic and covalent hydrides and oxides; acid-forming, basic, and amphoteric oxides. Water. Characteristics of some of the elements (chlorine, sulfur, nitrogen, phosphorus, carbon, silicon, alkali metals and alkaline earth metals, iron, copper, aluminium, and zinc) and of their important compounds (oxides, hydroxides, covalent hydrides, oxoacids, and salts). Progress test 2

9	15.-16.12.	Bonds in organic compounds, typical properties of organic compounds. Types of reactions in organic chemistry. Isomerism – various types of structural isomerism and stereoisomerism. Nomenclature of organic compounds: Systematic IUPAC names – general principles in systematic nomenclature. The trivial (or semisystematic) names for the most common compounds.
10	12.-13.1.	Hydrocarbons, names for the groups derived from hydrocarbons. Saturated and unsaturated hydrocarbons, arenes – chemical formulas, typical reactions. Organic halides, nitro compounds, amines – various types and important structures, the basicity of amines, the formation of amides. Alcohols and phenols – classification, typical reactions (esterification, ethers, oxidation of alcohols, quinones). Aldehydes and ketones - oxidation and reduction, the formation of acetals.
11	19.-20.1.	Carboxylic acids – reactivity of the carboxyl group. Survey of the common names and structures of the most important carboxylic acids (monocarboxylic and dicarboxylic, saturated and unsaturated, hydroxy acids, keto acids), names for acyls Functional derivatives of carboxylic acids (esters, amides, anhydrides, urea).
12	26.-27.1.	Heterocyclic compounds – names and structures, important derivatives, purine and pyrimidine bases of nucleic acids, uric acid. Saccharides - classification, structure of monosaccharides (acyclic oxo-forms, hemiacetal cyclic forms, anomers), the formation of glycosides. Reducing and non-reducing disaccharides, polysaccharides. Progress test 3
13	2.-3.2.	Lipids - fatty acids bound in lipids, acylglycerols, hydrolysis of fats and oils, saponification, soap. Phospholipids. The structure of membranes.
14	9.-10.2.	Steroids – the structure of the steroid ring system, biological roles of some sorts of steroid compounds. Amino acids - structures, common and systematic names of the twenty standard (proteinogenic) amino acids, the polarity of the side chains. Peptide bond. Peptides.

15	16.-17.2.	<p>Proteins – the primary structure, general features of the secondary, tertiary, and quaternary structure. Classification of proteins according to the shape, solubility, denaturation.</p> <p>Nucleosides, nucleotides, nucleic acids. The double helix of DNA.</p>
16	23.-24.2.	<p>The function of DNA and of three major types of RNA in transcription of the genetic code and protein biosynthesis.</p> <p>General features of enzymes. Factors affecting the rate of enzymatic reaction. Enzyme nomenclature and classification. Six classes of enzymes according to reaction type. Enzyme cofactors.</p> <p>Progress test 4</p>
17	2.-3.3.	<p>General features of vitamins. Fat soluble vitamins. Water soluble vitamins. Relations of vitamins to cofactors and other biochemical functions.</p> <p>The anabolic and catabolic character of metabolic pathways. The importance of biological oxidations in the catabolism of nutrients – , high-energy (macroergic) compounds and the energetic yield of metabolism.</p>
18	9.-10.3.	<p>The role of the citric acid cycle. The mitochondrial electron transport chain and oxidative phosphorylation</p> <p>Metabolism of saccharides, the end products of anaerobic and aerobic glucose degradation.</p>
19	16.-17.3	<p>Metabolism of lipids, digestion of dietary fat, β-oxidation of fatty acids.</p> <p>Metabolism of proteins and amino acids, the nitrogenous end products of amino acid and purine catabolism.</p> <p>Progress test 5</p>
20	23.-24.3.	<u>Compensatory lessons, Final test</u>