Course Title: Biochemistry with Chemistry
Coordinator /contact: Dr hab. Maria Wróbel /e-mail: mbwrobel@cyf-kr.edu.pl
Responsible person/contact: Dr hab. Maria Wróbel /e-mail: mbwrobel@cyf-kr.edu.pl
Address: Chair of Medical Biochemistry, Kopernika 7
Year: 1-6
Total number of hours: **190**
Lectures: **76**
Seminars: **30**
Labs/Practicals: **54**
Others (e.g. recitation): **18**
Exams: **12**

Conduct/Dress Code: **white coat (labs)**

Student's Evaluation:
- grading scheme: Students have to achieve 60% of total points (MCQ tests: partial, final and labs)
- absence allowed: labs - 1 per each semester
- type of the final crediting: MCQ test – June 9, 2017
- retake information: MCQ test – September 25, 2017

ECTS: 13

3rd week Sep 19-23	Tu	10:15-12:30	Preliminary course in Chemistry Rec.1	3	Gr. A,B,C,D E,F,G H,I,J	Basic concepts of chemistry: Periodic table of elements, elements, atomic number and mass of elements. Definitions: Dalton, Mole, molar mass, calculations the molar mass of: molecules, ions and compounds. The rules of naming acids, bases and salts	dr Sławomir Olszowski dr Barbara Stopa dr D. Ciołczyk-Wierzbicka	CH r.5 r.8
	Th	10:15-12:30	Preliminary course in Chemistry Rec.2	3	Gr. A,B,C,D E,F,G H,I,J	Percentage % and molar concentrations – calculations. Dilution. Dilution factor and Mixing rule ("Rule of the Cross"). Concentrations – recalculations: M, mM and μM. Calculation of products concentrations in reaction mixtures. Logarithms – calculations	dr J. Dulińska-Litewka dr D. Ciołczyk-Wierzbicka dr Sławomir Olszowski	CH r.5 r.8
4th Sep 26-30	Tu	10:15-12:30	Preliminary course in Chemistry Rec. 3	3	Gr. A,B,C,D E,F,G H,I,J	Chemical equilibria. Chemical equilibrium, equilibrium law(expression), equilibrium constant. Le Chatelier's Principle. Weak and strong electrolytes. Ionic equilibria: a. Ionic equilibria – dissociation reactions. Brönsted-Lowry concept of acids and bases. Acid-base conjugated pair. Strong and weak acids and bases. Dissociation constants of weak acids (Ka) and bases (Kb). pK. b. Water dissociation. Ion product of water. pH concept. pH calculations. c. Percentage dissociation α.	dr Barbara Stopa dr Sławomir Olszowski dr J. Dulińska-Litewka	CH r.5 r.8
	Th	10:15-12:30	Preliminary course in Chemistry Rec.4	3	Gr. A,B,C,D E,F,G H,I,J	1. Naming hydrocarbons (IUPAC). Alkanes, alkenes alkynes, cycloalkanes, cycloalkenes, aromatic compounds, halogen substitutions, alcohols, ketons, thiols, aldehydes and carboxylic acids, esters, ethers, thioeters. 2. Selected reactions of alkanes, alkenes, alkynes and aromatic compounds: a. Products of substitution and elimination reactions - organic halides, b. Electrophilic addition to alkenes (addition of unsymmetric reagents to alkens; Markownikov's rule), c. aromatic substitution, d. Alcohols - dehydratation, oxidation and ester formation, e. Alcohols - addition reaction to the carbonyl group – hemiacetal, f. Thiols (oxidation to disulphide or sulfo derivatives)	dr D. Ciołczyk-Wierzbicka dr Barbara Stopa dr J. Dulińska-Litewka	CH r.5 r.8
5th week	Tu	12.00-13.45	Lec 1	2	Whole	**Water as a solvent. Weak interactions in aqueous solutions.** Composition of body fluids. The	dr S. Olszowski	LH

Oct 3-7					class	four organic basic elements, essential dietary minerals and microelements. Weak interactions in water solutions – hydrogen bond, hydrophobic and van der Waals interactions – examples of biological importance. Water as a reactant – hydrolysis reactions . Electronegativity of elements. Polar and nonpolar molecules. Electrostatic interactions of water. The fitness of the aqueous environment for living organisms. Semipermeable membranes – osmotic and oncotic pressure. Colloidal solutions. Osmotic pressure and Donnan Membrane Equilibria.		
		14.00-15.30	sem1	2	Gr.E,F	**Typical organic reactions. Carbocations, carboanions and free radicals. Nucleophiles and electrophiles. Isomers** – classification and examples constitutional (tautomerisation of carbonyl compounds) and stereoisomers (conformational and configurational /enantiomers, diastereomers and cis-trans isomers/). Naming (chemical and **common names)** and **characteristic reactions** of simple organic **alcohols, thiols, aldehydes and carboxylic acids**.(Alcohols - dehydratation, dehydrogenation and esterification reactions with oxoacids or carboxylic acids. Oxidations of thiols. Alcohols - addition reaction to the carbonyl group – hemiacetal, acetal. Aldol condensation.) **Aromatic compounds –** definition and properties. Q	dr B. Stopa	room 5
					Gr.G,H		dr S. Olszowski	room 8
					Gr. I,J		dr J. Dulińska-Litewka	CH
	Th	11.45-13.15	sem 1	2	Gr. A,B	**Typical organic reactions. Carbocations, carboanions and free radicals. Nucleophiles and electrophiles. Isomers** – classification and examples constitutional (tautomerisation of carbonyl compounds) and stereoisomers (conformational and configurational /enantiomers, diastereomers and cis-trans isomers/). Naming (chemical and **common names)** and **characteristic reactions** of simple organic **alcohols, thiols, aldehydes and carboxylic acids**.(Alcohols - dehydratation, dehydrogenation and esterification reactions with oxoacids or carboxylic acids. Oxidations of thiols. Alcohols - addition reaction to the carbonyl group – hemiacetal, acetal. Aldol condensation.) **Aromatic compounds –** definition and properties. Q	dr B. Stopa	room 5
					Gr.C,D		dr S.Olszowski	Room 8
	Fr	10.00-13.00	Lab 1	4	Gr. A	**Safety regulations for laboratory classes. Calculations:** molar and percent concentration of a solution, preparing a solution of known molarity by dilution. **Absorption spectroscopy.**	dr S. Olszowski	lab 1
					Gr. B		dr B. Stopa	lab 2
					Gr. C		dr J. Dulińska-Litewka	lab 3
					Gr. D		dr D. Ciołczyk-Wierzbicka	lab 4
6th week Oct 10-14	Mo	12.15-13.45	Lec 2	2	whole class	**Ionic equilibria.** Water dissociation. pH concept. Brönsted-Lowry concept of acids and bases. Acid-base conjugated pair. Strong and weak acids and bases. Dissociation constants of weak acids (K_a) and bases (K_b). Buffer solutions. Henderson-Hasselbalch equation. **Basics of pH and water homeostasis in human organism.** Buffer solutions – mechanism of action. Biological buffer systems (bicarbonate, phosphate, ammonia and protein). Bicarbonate buffer – components, pH. Normal ranges of bicarbonate buffer parameters in blood. Carbon dioxide transport in blood. Oxygen transport - role of hemoglobin. Regulation of bicarbonate concentration – role of kidneys. Simple acid – base disorders.	dr B. Stopa	LH
	Tu	12.00-13.45	Lec 3	2	whole class	**Basics of thermodynamics. Spontaneity of chemical reactions.** Enthalpy change ΔH Bond energies (enthalpies). The 1st law of thermodynamics. Entropy change ΔS. The 2nd law of thermodynamics. ΔG^o and equilibrium constant. Spontaneity of chemical reactions - ΔG. The free energy change and the equilibrium constant. Biological standard conditions. Coupled reactions. ATP. High-energy phosphates. **Oxidation – reduction reactions.** Oxidation, reduction – definitions. Oxidation numbers. Galvanic cells. Standard and biological standard reduction half-cell potentials. Half-cell potentials under nonstandard conditions - Nernst equation.	dr S. Olszowski	CH
		14.00-15.30	sem 2	2	Gr. E,F	**Ionic equilibria**. Slightly soluble salts - solubility product constant K_{sp} and solubility calculations. Common ion effect. **Buffers.** Buffer solutions-definition and examples. Henderson - Hasselbach equation. Buffer capacity and pH calculations. **Protein ligand complexes formation – calculation of dissociation constants.** Q	dr B. Stopa	room 5
					Gr.G,H		dr S. Olszowski	room 8
					Gr. I,J		dr D. Ciołczyk-Wierzbicka	CH
		16.45-19.45	Lab 1	4	Gr. E	**Safety regulations for laboratory classes. Calculations:** molar and percent concentration of a solution, preparing a solution of known molarity by dilution. **Absorption spectroscopy.**	dr J. Dulińska-Litewka	lab 2
					Gr. F		dr D. Ciołczyk-Wierzbicka	lab 4

	Th	11.45-13.15	sem 2	2	Gr. A,B	**Ionic equilibria**. Slightly soluble salts - solubility product constant K_{sp} and solubility calculations. Common ion effect. **Buffers.** Buffer solutions-definition and examples. Henderson & Hasselbach equation. Buffer capacity and pH calculations. **Protein ligand complexes formation – calculation of dissociation constants.** Q	dr S. Olszowski	room 5
					Gr.C,D		dr J. Dulińska-Litewka	room 8
	Fr	10.00-13.00	Lab 1	4	Gr.G	**Safety regulations for laboratory classes. Calculations:** molar and percent concentration of a solution, preparing a solution of known molarity by dilution. **Absorption spectroscopy.**	dr S. Olszowski	Lab 1
					Gr. H		dr B. Stopa	lab 2
					Gr. I		dr J. Dulińska-Litewka	lab 3
					Gr. J		dr B. Ostrowska	lab 4
7th week Oct 17-21	Mo	12.15-13.45	Lec 4	2	Whole class	**Proteins I.** Folding of proteins and levels of their organization. Globular and fibrous proteins. Connective tissue proteins. Collagen. Diseases of collagen synthesis. Protein structure-function relationship. Conformational diseases – amyloidoses, prion diseases.	Dr. Barbara Piekarska	CH
	Tu	12.00-13.45	Lec 5	2	Whole class	**Proteins II.** Physicochemical properties of proteins in solution. Protein stability and denaturation. Methods of protein separation and analysis. Serum proteins. Plasma proteins in diagnosis of diseases. Lipoproteins and glycoproteins.	Dr. Barbara Piekarska	CH
		14.00-15.30	sem 3	2	Gr. E,F	**Amino acids**. Aliphatic and aromatic amines. Amines as bases. Addition to aldehydes – Schiff base formation. Amino acids - classification. Acid-base properties of amino acids – predominant ionic forms at different pH. Isoelectric point – calculations. Peptide bond. Peptides and proteins. Levels of protein structure. Stabilization of protein structure. Isoelectric point of peptides and proteins. Q	dr D. Ciołczyk-Wierzbicka	r. 5
					Gr.G,H		dr S. Olszowski	r. 8
					Gr. I,J		dr J. Dulińska-Litewka	CH
	Th	11.45-13.15	sem 3	2	Gr. A,B	**Amino acids**. Aliphatic and aromatic amines. Amines as bases. Addition to aldehydes – Schiff base formation. Amino acids - classification. Acid-base properties of amino acids – predominant ionic forms at different pH. Isoelectric point – calculations. Peptide bond. Peptides and proteins. Levels of protein structure. Stabilization of protein structure. Isoelectric point of peptides and proteins. Q	dr S. Olszowski	r. 5
					Gr.C,D		dr B. Stopa	r. 8
	Fr	10.00-13.00	Lab 2	4	Gr.A	**Acids, bases and buffers. pH meter – basis of action. Potentiometric titration of a strong / weak acid**.	Dr D. Gil	Lab 1
					Gr.B		dr B. Stopa	lab 2
					Gr.C		dr J. Dulińska-Litewka	lab 3
					Gr.D		dr D. Ciołczyk-Wierzbicka	lab 4
8th week Oct 24-28	Mo	12.15-13.45	Lec 6	2	Whole class	**Proteins III**. Heme proteins: myoglobin, hemoglobin, cytochromes. Pathological hemoglobins.	Dr. B. Piekarska	CH
	Tu	12.00-13.45	Lec 7	2	Whole class	**Basis of chemical kinetics.** Definition of a reaction rate. Rate law, rate constant and rate order. Factors affecting reaction rates (c, T, pH). Arrhenius equation. Collision theory and Transition State theory. Activation energy. Reaction mechanism. Integrated rate law for 1st order reaction – half-life. Progress curve. Catalysis – examples of inorganic catalysts. Biocata/ysts.	Dr J. Dulińska-Litewka	CH
		14.00-15.30	sem 4	2	Gr. E,F	**Basics of thermodynamics. Spontaneity of chemical reactions. Chemical kinetics.** Spontaneity of chemical reactions - ΔG . Calculations of the **free energy change** under standard (ΔG^{o}), biological standard ($\Delta G^{o'}$) and nonstandard conditions (ΔG). ΔG^{o} and equilibrium constant K. Calculations of K and concentrations at equilibrium from thermodynamic data (entalphy ΔH, entropy ΔS etc). Definition of a reaction rate. Rate law, rate constant and rate order. Factors affecting reaction rates. Reaction rate theories. Activation energy. Reaction mechanism. Determination of the reaction order and the rate low and from experimental data. Integrated rate law for 1st order reaction – half-life. Progress curve. Calculations. Q	dr B. Stopa	r. 5
					Gr.G,H		dr S. Olszowski	r. 8
					Gr. I,J		dr J. Dulińska-Litewka	CH
		16.45-19.45	Lab 2	4	Gr. E	**Acids, bases and buffers. pH meter – basis of action. Potentiometric titration of a strong / weak acid**.	Dr D. Gil	lab 2
					Gr. F		dr S. Olszowski	lab 4
	Th	11.45-13.15	sem 4	2	Gr. A,B	**Basics of thermodynamics. Spontaneity of chemical reactions. Chemical kinetics.** Spontaneity of chemical reactions - ΔG . Calculations of the **free energy change** under standard (ΔG^{o}), biological standard ($\Delta G^{o'}$) and nonstandard conditions (ΔG). ΔG^{o} and equilibrium constant K.	dr J. Dulińska-Litewka	r. 5
					Gr.C,D		dr S. Olszowski	CH

						Calculations of K and concentrations at equilibrium from thermodynamic data (entalphy ΔH, entropy ΔS etc). Definition of a reaction rate. Rate law, rate constant and rate order. Factors affecting reaction rates. Reaction rate theories. Activation energy. Reaction mechanism. Determination of the reaction order and the rate low and from experimental data. Integrated rate law for 1st order reaction – half-life. Progress curve. Calculations. Q		
	Fr	10.00-13.00	Lab 2	4	Gr. G	**Acids, bases and buffers. pH meter – basis of action. Potentiometric titration of a strong / weak acid**.	Dr S. Olszowski	lab 1
					Gr. H		dr D. Gil	lab 2
					Gr. I		dr J. Dulińska-Litewka	lab 3
					Gr. J		dr D. Ciołczyk-Wierzbicka	lab 4
9th week Nov 2-4 We-Fr						----------		
	Fr	10.00-13.00	Lab 3	4	Gr. G	**Amino acids and proteins.** Paper chromatography of amino acids. Calculating pI of peptides and proteins using computer program. Characteristic reactions of amino acids. Dialysis.	dr S. Olszowski	lab 1
					Gr. H		dr B. Stopa	lab 2
					Gr. I		dr. J. Dulińska-Litewka	lab 3
					Gr. J		dr B. Ostrowska	lab 4
10th week Nov 7-10 Mo-Th	Mo	12.00-13.45	Lec 8	2	Whole class	**Enzymes I.** The protein catalysts of cells. Chemistry of the active site. Coenzymes. Classifications of enzymes.	Prof. Laidler/dr. Maria Wróbel	LH
	Tu	12.00-13.45	Lec 9	2	Whole class	**Enzymes II.** Enzyme specificity and catalytic power. Michaelis-Menten and allosteric kinetics. Inhibition of enzyme activity. Drugs as specific inhibitors of enzymes.	Prof. Laidler/dr. Maria Wróbel	LH
		14.00-16.15	Lab 4	3	Gr. E,F	Computer modeling. Proteins.	Mgr Mateusz Banach	
					Gr G,H		dr Monika Piwowar	
		16.30-18.45	Lab 4	3	Gr. A,B	Computer modeling. Proteins.	Mgr Mateusz Banach	
					Gr. C,D		dr Monika Piwowar	
		16.45-19.45	Lab 3	4	Gr. E	**Amino acids and proteins.** Paper chromatography of amino acids. Calculating pI of peptides and proteins using computer program. Characteristic reactions of amino acids. Dialysis.	dr. J. Dulińska-Litewka	lab 2
					Gr. F		dr S. Olszowski	lab 4
11th week Nov 14-18	Mo	12.15-13.45	Lec 10	2	Whole class	**Enzymes III.** Mechanism of enzyme catalysis (lysozyme, serine proteases, ribonuclease). Control of enzyme activity. Isoenzymes. Diagnostic enzymes.	Prof. Laidler/dr. Maria Wróbel	LH
	Tu	14.00-15.30	sem 5	2	Gr. E,F	**Case I.** Sickle cell anemia (supplementary materials on the website!) **Case II.** Acetylcholinesterase inhibition (supplementary materials on the website!).	dr D. Ciołczyk-Wierzbicka	r. 5
					Gr.G,H		dr J. Dulińska-Litewka	r. 8
					Gr.I,J		dr. D. Gil	CH
		16.30-18.45	Lab 4	3	Gr. I,J	Computer modeling. Proteins.	Mgr Mateusz Banach	
		16.45-19.45	Lab3	4	Gr. A	**Amino acids and proteins.** Paper chromatography of amino acids. Calculating pI of peptides and proteins using computer program. Characteristic reactions of amino acids. Dialysis.	dr S. Olszowski	lab 1
					Gr. B		dr D. Gil	lab 2
					Gr. C		dr. J. Dulińska-Litewka	lab 3
					Gr. D		dr D. Ciołczyk-Wierzbicka	lab 4
	Th	11.45-13.15	Sem 5	2	Gr. A,B	**Case I.** Sickle cell anemia (supplementary materials on the website!) **Case I,.** Acetylcholinesterase inhibition (supplementary materials on the website!).	dr. D. Gil	r. 5
					Gr.C,D		Dr J. Dulińska-Litewka	CH
	Fr	10.00-13.00	Lab 5	4	Gr. A	**Proteins.**	Dr A. Bentke	lab 1
					Gr. B		dr. D. Gil	lab 2
					Gr. C		dr H. Jurkowska	lab 3
					Gr. D		dr. K. Kocemba	Lab 4
12th								

week Nov 21-25	Tu	12.00-13.45	rec 5		Whole class	**Review**. Carbon compounds. Isomers. Water. Weak interactions in aqueous solutions. Covalent bonds. Ionic equilibria. pH Concept. Buffer solutions. Basics of thermodynamics. Basis of chemical kinetics. Amino acids, proteins and enzymes.	dr J. Dulińska-Litewka	CH
		16.45-19.45	Lab 5		Gr. E	**Proteins.**	Dr J. Dulińska-Litewka	lab 2
					Gr. F		dr. B.Piekarska	lab 4
	Fr	10.00-13.00	Lab 5	4	Gr. G	**Proteins.**	Dr. B. Piekarska	lab 1
					Gr. H		Dr A. Bentke	lab 2
					Gr. I		dr H. Jurkowska	lab 3
					Gr. J		dr. K. Kocemba	lab 4
13th week Nov 28-Dec 2	Mo	12.15-13.45	**Ex.1**	2	Whole class	**Test 1.** Carbon compounds. Isomers. Water. Weak interactions in aqueous solutions. Covalent bonds. Ionic equilibria. pH Concept. Buffer solutions. Basics of thermodynamics. Basis of chemical kinetics. Amino acids, proteins and enzymes.	dr B. Stopa dr J. Dulińska-Litewka	LH CH
	Tu	12.00-13.45	Rec2	2	Whole class	**Discussion on Exam I.**	dr J. Dulińska-Litewka	CH
		14.00-15.30	sem 6	2	Gr. E,F	**DNA chemical structure.** Physicochemical properties of DNA. DNA polymerases, endo- and exonucleases. **Q**	dr. Barbara Piekarska	r. 5
					Gr.G,H		dr K. Kocemba	r. 8
					Gr.I,J		dr. M. Wróbel	CH
		16.30-18.45	Lab 6	3	Gr. I,J	**Computer modeling.** Genomics	Dr Monika Piwowar	
		16.45-19.45	Lab 7		Gr. E	**Enzyme kinetics.**	dr H. Jurkowska	
					Gr. F		dr K. Kocemba	
	Th	11.45-13.15	sem 6	2	Gr. A,B	**DNA chemical structure.** Physicochemical properties of DNA. DNA polymerases, endo- and exonucleases. **Q**	dr. Barbara Ostrowska	r. 5
					Gr.C,D		dr. M. Wróbel	CH
	Fr	10.00-13.00	Lab 7		Gr. E	**Enzyme kinetics.**	Dr A. Bentke	
					Gr. H		dr. B. Piekarska	
					Gr. I		dr K. Kocemba	
					Gr. J		dr. Barbara Ostrowska	
14th week Dec 5-9	Mo	12.15-13.45	Lec 11	2	Whole class	**DNA I.** Watson and Crick model of DNA. Types of DNA structure (A, B and Z DNA). Viral, bacterial and eukaryotic DNA. Interaction of nucleic acids and proteins. Nucleosomes and higher order structures. Chromosome structure.	dr. M. Wróbel	LH
	Tu	12.00-13.30	Lec 12	2	Whole class	**DNA II.** Replication of DNA and its enzymatic machinery. Telomere maintenance. Cutting and joining DNA - restriction endonucleases, DNA ligases. Recombinant DNA molecules.	dr. M. Wróbel	LH
		14.00-16.15	Lab 6	3	Gr.A,B	**Computer modeling.** Genomics.	Dr Monika Piwowar	
	Fr	10.00-13.00	Lab 7	4	Gr. A	**Enzyme kinetics.**	Dr A. Bentke	
					Gr. B		dr. B. Piekarska	
					Gr. C		dr. G. Gil	
					Gr. D		dr. H. Jurkowska	
		12:45-15.00	lab 6	3	Gr.,G,F	**Computer modeling.** Genomics	Dr Monika Piwowar	
15th week Dec 12-16	Mo	12.15-13.45	Lec 13	2	Whole class	**Mutations** and DNA repair systems.	dr. M. Wróbel	LH
	Tu	12.00-13.45	Lec 14		Whole class	**RNA I.** Physicochemical and biological properties of RNA. Types of RNA: rRNA, mRNA, hnRNA, tRNA. Ribonucleoprotein particles. Levels of RNA organization - three-dimensional structure of RNA. Bacterial and eukaryotic RNA polymerases. DNA dependent synthesis of RNA.	dr. P. Laidler	CH

		14.00-16.15	Lab 6	3	Gr. C,D	**Computer modeling.** Genomics.	Dr Monika Piwowar	
		16.30-18.45	Lab 6	3	Gr.G,H		Dr Monika Piwowar	
	Th	11.45-13.15	sem 7	2	Gr. A,B	**Introduction to laboratories "From gene to protein".**	dr. D. Gil	ChMB r. 5
					Gr.C,D		Dr. H. Jurkowska	CH
	Fr	10.00-13.00	Lab 8	4	Gr. A	**Laboratories.** "From gene to protein" – part 1.	dr. A. Bentke	lab 1
					Gr. B		dr. D. Ciołczyk-Wierzbicka	lab 2
					Gr. C		dr. D. Gil	lab 3
					Gr. D		dr H. Jurkowska	lab 4
16th week Jan 9-13	Mo	12.15-13.45	Lec 15	2	Whole class	**RNA II.** Posttranscriptional processing of hnRNA. Transcription units. Inhibitors of transcription. RNA dependent synthesis of DNA. Regulation of transcription in Prokaryotes - the operon system.	dr. P. Laidler	CH
	Tu	12.00-13.45	Lec 16	2	Whole class	**Basic genetic engineering methods**: DNA sequencing, DNA amplification (cloning, PCR), genomic and cDNA libraries, DNA electrophoresis, blotting, detection (probes), RFLP.	dr. B. Piekarska	CH
		14.00-15.30	sem 7	2	Gr. E,F	**Introduction to laboratories "From gene to protein".**	dr. B. Piekarska	ChMB r. 5
					Gr.G,H		dr J. Dulińska-Litewka	ChMB r. 8
					Gr.I,J		dr. D. Gil	CH
		16.45-19.45	Lab 8	4	Gr. E	**Laboratories.** "From gene to protein" – part 1.	dr. J. Dulińska-Litewka	lab 2
					Gr. F		dr. B. Piekarska	lab 4
	Fr	10.00-13.00	Lab 8	4	Gr. G	**Laboratories.** "From gene to protein" – part 1.	dr. B. Ostrowska	lab 1
					Gr. H		dr. K. Kocemba	lab 2
					Gr. I		dr H. Jurkowska	lab 3
					Gr. J		dr. J. Dulińska-Litewka	lab 4
17th week Jan 16-20	Mo	12.15-13.45	Lec 17	2	Whole class	**Human Immunodeficiency Virus.** Structure, genome, infection cycle, reverse transcription. Detection tests. Antiretroviral drugs – nucleoside and non-nucleoside reverse transcriptase inhibitors, protease inhibitors.	dr. B. Piekarska	CH
	Tu	12.00-13.45	Lec 18	2	Whole class	**Protein synthesis.** Genetic code and its properties. The components of the protein biosynthesis apparatus. Initiation, elongation and termination of the peptide chain. Synthesis of short peptides.	dr. B. Piekarska	CH
		14.00-15.30	Sem 8	2	Gr.E,F	**Oxidation – reduction reactions.**	dr B. Stopa	room 5
					Gr.G,H	Oxidation, reduction – definitions. Oxidation numbers. Galvanic cell. Cell and half-cell potentials.	dr S. Olszowski	room 8
					Gr. I,J	Standard reduction half cell potentials E^0. Half-cell potentials under biological standard conditions ($E^{0\prime}$) and nonstandard conditions (E). Spontaneity of redox reactions. Calculation involving the Nernst equation (ΔE,K). Electron flow direction in respiratory chain reactions. Q	dr J. Dulińska-Litewka	CH
		16.45-19.45	Lab 9	4	Gr. E	**Laboratories.** "From gene to protein" – part 2.	dr. H. Jurkowska	lab 2
					Gr. F		dr B. Ostrowska	lab 4
					Gr. G		Dr A. Bentke	
					Gr.H		Dr. K. Kocemba	
	Th	11.45-13.15	Sem 8	2	Gr. A,B	**Oxidation – reduction reactions.**	dr S. Olszowski	room 5
					Gr.C,D	Oxidation, reduction – definitions. Oxidation numbers. Galvanic cell. Cell and half-cell potentials. Standard reduction half cell potentials E^0. Half-cell potentials under biological standard conditions ($E^{0\prime}$) and nonstandard conditions (E). Spontaneity of redox reactions. Calculation involving the Nernst equation (ΔE,K). Electron flow direction in respiratory chain reactions. Q	dr J. Dulińska-Litewka	room 8
	Fr	10.00-13.00	Lab 9	4	Gr. A	**Laboratories.** "From gene to protein" – part 2.	dr J. Dulińska-Litewka	lab 1
					Gr. B		dr. K. Kocemba	lab 2
					Gr. C		dr. D. Gil	lab 3
					Gr. D		dr D. Ciołczyk-Wierzbicka	lab 4

18th week Jan 23-27	Mo	12.15-13.45	Lec 19	2	Whole class	**Protein processing, targeting and degradation.** Posttranslational modifications. Synthesis of glycoproteins and the role of glycosylation in targeting of proteins. Inhibitors of protein biosynthesis. Mechanisms involved in protein degradation.	dr. B. Piekarska	CH
	Tu	12.00-13.45	Lec 20	2	Whole class	**Mitochondrial respiratory chain**. Mitochondrion as a power plant. Electron transport. Oxidative phosphorylation. Inhibitors of electron transport and oxidative phosphorylation. **The tricarboxylic acid cycle (TCA).** The concept of catabolism, sources of acetyl-CoA. Oxidative decarboxylation of alpha ketoacids. Reactions of citric acid cycle. Control of TCA. Anaplerotic reactions.	dr. B. Piekarska	CH
		14.00-15.30	rec 3	2	Gr.E,F	**Review.** Nucleic acids structure & metabolism. Protein biosynthesis and targeting.	dr. M. Wróbel	room 5
					Gr.G,H		dr. B. Piekarska	room 8
					Gr. I,J		dr J. Dulińska-Litewka	CH
		16.45-19.45	Lab 9		Gr.I	**Laboratories. "From gene to protein" – part 2.**	dr. H. Jurkowska	
					Gr.J		dr. B. Ostrowska	
	Th	11.45-13.15	rec 3	2	Gr. A,B	**Review.** Nucleic acids structure & metabolism. Protein biosynthesis and targeting.	dr. M. Wróbel	room 5
					Gr.C,D		dr. B. Piekarska	room 8
	Fr	10.00-13.00	Lab 10	4	Gr.E	**Laboratories.** "From gene to protein" – part 3.	dr K. Kocemba	lab 1
					Gr.H		dr. B. Ostrowska	lab 2
					Gr.I		dr. H. Jurkowska	lab 3
					Gr.J		dr D.Ciołczyk-Wierzbicka	lab 4
19th week Jan 30-Feb 3	Mo	12.15-13.45	**Ex. 2**	2	Whole class	**Test 2.** Nucleic acids structure & metabolism. Protein biosynthesis and targeting.	dr. B. Piekarska	LH
							dr. M. Wróbel	CH
	Tu	12.00-13.45	Rec 4	2	Whole class	**Discussion on Exam II.**	Dr. M. Wróbel	CH
	Fr	10.00-13.00	Lab 10	4	Gr. A	**Laboratories.** "From gene to protein" – part 3.	dr J. Dulińska-Litewka	lab 1
					Gr. B		dr. B. Ostrowska	lab 2
					Gr. C		dr D.Ciołczyk-Wierzbicka	lab 3
					Gr. D		dr H. Jurkowska	lab 4
		13.15-16.15	Lab 10	4	Gr. G	**Laboratories.** "From gene to protein" – part 3.	dr. D. Gil	lab 2
					Gr. F		dr J. Dulińska-Litewka	lab 4