FACULTY OF PHARMACY

STUDY PROGRAMME

First Year

1st semester					
Subjects	**Lectures**	**Practices**	**Credit Points**	**Prerequisites**	**Examination**
General and Inorganic Chemistry I. Practice GYASKASKG1A	–	5	5	–	practical course grade
General and Inorganic Chemistry I. GYASKASKE1A	4+1	–	5	–	semi-final
Introduction to Health Informatics I. Practice GYINFBEIG1A	–	1	–	–	signature
Introduction to Health Informatics I. GYINFBEIE1A	1	–	2	–	semi-final
Biophysics I. Practice GYFIZBIFG1A	–	3	2	–	practical course grade
Biophysics I. GYFIZBIFE1A	2	–	3	–	semi-final
Biology I. Practice GYGENBILG1A	–	2	2	–	practical course grade
Biology I. GYGENBILE1A	2	–	2	–	semi-final
Medical Terminology** GYLEKOTRG1A	–	2	2	–	practical course grade
Mathematics I. Practice GYEGYMATG1A	–	2	2	–	practical course grade

Mathematics I. GYEGYMATE1A	2	–	2	–	semi-final
Physical Education I. GYTSITSNG1A	–	1	0	–	signature
History of Sciences, Propedeutics GYEGYTTPE1A	2	–	2	–	semi-final
Hungarian Medical Terminology I. * GYLEKMSZG1A	–	4	4	–	practical course grade
Total Credit			**33**		

2nd semester						
Subjects	**Lectures**	**Practices**	**Credit Points**	**Prerequisites**		**Examination**
General and Inorganic Chemistry II. GYASKASKE2A	3	–	3	GYASKASKE1A	General and Inorganic Chemistry I.	final #
Analytical Chemistry I. (qualitative) GYASKANKG1A	2	5	5	GYASKASKE1A	General and Inorganic Chemistry I.	practical course grade
Anatomy GYANTANAE1A	2	–	4	GYGENBILE1A	Biology I.	semi-final
Anatomy Practice GYANTANAG1A	–	2	–	GYGENBILE1A	Biology I.	signature
Introduction to Health Informatics II. Practice GYINFBEIG2A	–	1	–	GYINFBEIE1A	Introduction to Health Informatics I.	signature
Introduction to Health Informatics II. GYINFBEIE2A	1	–	2	GYINFBEIE1A	Introduction to Health Informatics I.	semi-final
Biophysics II. Practice GYFIZBIFG2A	–	3	2	GYFIZBIFE1A	Biophysics I.	practical course grade
Biophysics II. GYFIZBIFE2A	2	–	3	GYFIZBIFE1A	Biophysics I.	final #

Biology II. Practice GYGENBILG2A	–	2	1	GYGENBILE1A	Biology I.	practical course grade
Biology II. GYGENBILE2A	2	–	2	GYGENBILE1A	Biology I.	final #
Pharmaceutical Botany I. GYNOV-GYNG1A	1	2	3	GYGENBILE1A	Biology I.	practical course grade
Mathematics II. Practice GYEGYMATG2A	–	1	1	GYEGYMATE1A GYINFBEIE1A	Mathematics I. Introduction to Health Informatics I.	practical course grade
Mathematics II. GYEGYMATE2A	2	–	2	GYEGYMATE1A GYINFBEIE1A	Mathematics I. Introduction to Health Informatics I.	semi-final
Physical Education II. GYTSITSNG2A	–	1	0			signature
First Aid GYTRAELSE1A	1	--	0			signature
Hungarian Medical Terminology II. * GYLEKMSZG2A	–	4	2	GYLEKMSZG1A	Hungarian Language I.	practical course grade
Total Credit			**30**			

\# The grade influences the qualification of the diploma
* Obligatory courses
** Obligatory elective courses: (2 credit points).

LIST OF TEXTBOOKS (The list may change!)

1 Alberts Essential Cell Biology (4th edition) Garland Science, ISBN-13: 978-0815344544; ISBN-10: 0815344546
2 Genetics and Genomics (e-book)
3 Faller, Schuenke: The Human Body: An Introduction to Structure and Function (Flexibook) Paperback – 2004. Thieme
4 Damjanovich – Fidy – Szöllõsi (eds) Medical Biophysics, Medicine, Budapest, 2009. ISBN 978 963 226 127 0
5 Miklós Kellermayer: Medical Biophysics Practices (Semmelweis Publishers, Budapest, 2015) ISBN 978-963-331-349-7
6 Rost et al.: Botany, a brief introduction to plant biology. Wiley.
7 Mihalik: Botany for Students of Pharmacy. (Szeged)
8 Lásztity-Noszál: Practical Inorganic and General Chemistry. Bp. (SOTE)

9 Lásztity-Gyimesi: Qualitative Inorganic Analysis. Bp. (SOTE)
10 Kõrös: General Chemistry. Bp. (SOTE)
11 Kõrös: Inorganic Chemistry. (Szeged)
12 Masterton-Hurley: Chemistry. Principles and Reactions. Saunders College Publishing, 1998.
13 1st semester: Gyöngyösi L. & Hetesy B., 2012. Jó reggelt! Bp. Semmelweis Egyetem Egészségtudományi Kar (available at Vas u. 17. Bookshop)
14 2nd-3rd semesters: Gyöngyösi L. & Hetesy B., 2011. Jó napot kívánok! Bp. Semmelweis Egyetem Egészségtudományi Kar (available at Vas u. 17. Bookshop)

Recommended textbooks:

1 Bland M.: An Introduction to Medical Statistics. (Oxford medical publication)
2 Batschelet,E.: Introduction to Mathematics for Life Scientists
3 Maróti-Berkes-Tölgyesi: Biophysics Problems. A Textbook with Answers. Bp. Akadémiai K. 1998. ISBN 963 05 7526 4
4 Alberts et al.: Molecular Biology of the Cell. Garland Science/Taylor & Francis Group Publ. (4^{th} ot 5^{th} edition)
5 Belák E. Medical Terminology for Beginners (earlier title: Medical Latin), Bp. Semmelweis Kiadó
6 Berg-Tymoczko-Stryer: Biochemistry 7th edition

MATHEMATICS

University Pharmacy, Department of Pharmacy Administration
Tutor: ***Dr. Andrea Meskó***

In the first year of the curriculum two hours of lectures are given to pharmacist students under the title above. The lectures are accompanied by practicals to help a better understanding and to get experienced in solving problems and exercises.

The title covers two, more or less independent, subjects. The majority of the lectures (over 60 per cent) is devoted to (classical) mathematics, the smaller part, however, in which biostatistics are given, is not of less importance.

The aim of learning classical mathematics is to understand biological, chemical, and physical processes dealt with in the subjects mentioned. The most appropriate mathematical model for the processes in nature are functions of one or more variables. To obtain the proper function for a particular process a differential equation is to be solved. The notion and the way of solution of differential equations is the central point of the course. The others namely limits, differential and integral calculus, discussion of functions, series etc. are, however, necessary preparatory steps for getting

acquainted with differential equations.
Biostatistics, the other subject under this title, is a more recent branch of sciences. Its importance is permanently increasing in each field where data are present, i.e. quite everywhere in scientific work. Pharmacological investigations, clinical trials, epidemiological studies (etc, etc.) cannot be carried on without the statistical analysis of the data obtained. The results of the above mentioned studies are always derived by statistical inference. Statistics is an indispensable part of any research from planning the experiment to interpretation of the results. Statistical methods are essential even for students in their laboratory work.

MATHEMATICS I.

University Pharmacy, Department of Pharmacy Administration
Tutor: ***Dr. Andrea Meskó***

First Semester

Lectures: 2 hours per week
Practicals: 2 hours per week

Differential and differential coefficient. Rules for derivations of functions.
The derivative of the power function.
Derivation of composite and inverse functions. Differentiability of
the elementary functions. Higher order derivatives.
Application of differentiation for calculation of limits of fractions.
An iterative method to solve equations (Newton-method).
Expansion of differentiable functions to power series. The Taylor series of
exp x, sin x, cos x, ln x and other functions.
Qualitative examination of functions. Roots, extremes and inflexion points.
The multiplicity of a root.
The complete discussion of elementary functions.
Integration as the inverse operation of derivation. The indefinite integral.
Integration of power functions. Integration of simple elementary functions.

Integration of products (the rule of "partial integration"). Integration of composite functions. Integration of rational fractions.
Area under a curve: the definite integral. Improprious integrals.
The concept of a differential equation. Differential equations arising in physics, chemistry, biology, botanics and other fields. The homogeneous linear differential equation with constant coefficients: solution and proof of unicity. Separation of variables as the method of solution. General and particular solutions. Introduction of new variables.
Nonlinear differential equations of the first order.
Differential equations of the chemical reactions of 0th, 1st and 2nd order.
Functions of several variables. Partial derivatives of first and second order. Differentiability and exact differential. Application of exact differential in error calculations. Maxima and minima of two-variable functions.
Different kinds of integration of functions of several variables. Integration along a line. Point functions and independence of the integral of the path.
Calculation of the integral along different curves.

MATHEMATICS II.

University Pharmacy, Department of Pharmacy Administration
Tutor: ***Dr. Andrea Meskó***

Second Semester

Lectures: 2 hours per week
Practicals: 1 hour per week

Introduction and information. The most common calculations in laboratory. Some hints for numerical calculations.
Biometrics and/or biostatistics. Statistical inference. Frequency distributions. Theoretical distribution and probability. The normal distribution.
Measures of central tendency (mode, median, mean etc.) Applications of the weighted mean. Measures of dispersion.
Standard deviation and variance. The coefficient of variation. Error bounds. The standard error of the mean.

The concept of "regression line". The linear regression: coefficients, interpretation, application.
The correlation coefficient: formula and interpretation. Uses and misuses of correlation coefficient. Lack of correlation vs. independence. Spurious correlations. Coefficient of determination.
Sampling distributions. Important distributions derived from the normal one: t F, and chis-quared distributions. The use of statistical tables.
Theoretical background of statistical inference. Qualitative and quantitative conclusions. Estimation; confidence interval for the expected value.
Testing hypotheses. The concept of "significance". Errors of the first and of the second kind. The t-tests.
Analysis of variance. The Ftest. Discrete and dichotomous distributions; variables on a nominal scale. The Poisson distribution.
Analysis of qualitative data. Counting tables. Measures of association and statistical tests in fourfold tables.
Sets (finite and infinite). Natural, integral, rational, real and complex numbers.
Definition of a function.
General attributes of the functions. Classification of elementary functions.
Rational and irrational functions.
Transcendent functions: exponential, logarithmic, trigonometric and cyclometric functions.
Limits of functions. Continuous functions.
Sequences and series. Series of functions. Power series.
Radius of convergency.

BIOLOGY I.

Department of Genetics, Cell- and Immunobiology
Course director: ***Prof. Dr. Edit Buzás***
Course coordinator: ***Dr. Orsolya Láng***
Subject code: GYGENBILG 1A (practice)
GYGENBILE1A (lecture)
Credit:4

1st Semester

Lectures: 2 hours per week
Practice: 2 hours per week

Week	*Lecture*	Practice
1.	The cell membrane: structure and function	The light microscope in use
2.	Structure and function of the nucleus I	General view of the cell. Light and electron microscopic microtechnique.
3.	Structure and function of the nucleus II	Cell nucleus. Cyto(histo)chemistry
4.	Endoplasmic reticulum and the ribosomes	Endoplasmic reticulum
5.	Golgi complex, secretion and protein transport	Golgi complex
6.	Lysosomes, endocytosis, vesicular transport	Midterm (written)
7.	Structure and function of mitochondria and peroxisomes	Secretion. Immunohistochemistry
8.	The cytoskeleton,	Endocytosis. Cellular digestion. Enzyme-histochemistry
9.	Cellular movement	Cell and tissue culture
10.	Cell adhesion, cell junctions	Store and supply of energy. Mitochondria. Peroxisome.
11.	Extracellular regulation of cells, signal transduction I	Cytoskeleton and cellular movement
12.	The cell cycle and its regulation I	Cell surface differentiation, ultrastructure of cellular junctions
13.	The cell cycle and its regulation II	Midterm (written)

14.	Cellular aging and programmed cell death (apoptosis)	Cell death (necrosis and apoptosis)

Important notes:
Students must visit at least 75% of the lessons. More than three absences from the practice or more than three absences from the lecture invalidate the semester, no signature is given. There are no extra practices.
There are two midterms during the semester. To get practice grade and signature the average of the midterms have to be 2.0. Missed or failed midterms might be repeated two times. No improvement of midterm grade.
Requirement of lecture signature is: practice grade and not more than three absences from the lectures.
Students having lecture and practice signature may give the exam. Exam is a written test (multiple choice, essay, drawing etc. similar to midterms) covering practice and lecture parts.

BIOLOGY II.

Department of Genetics, Cell- and Immunobiology
Course director: ***Prof. Dr. Edit Buzás***
Course coordinator: ***Dr. Orsolya Láng***
Subject code: GYGENBILG_2A (practice)
GYGENBILE_2A (lecture)
Prerequsite: Biology I.
Credit: 3
Lectures: 2 hours per week
Practices: 2 hours per week

Second Semester

Week	*Lectures*	Practices
1.	Meiosis	Typical and atypical mitosis
2.	Introduction to human genetics; human	Meiosis and gametogenesis

	genom	
3.	Mutations and polymorphisms I.	Cytogenetics I.
4.	Mutations and polymorphisms II.	Cytogenetics II.
5.	Epigenetics	Introduction to humangenetics; special methods of humangenetics
6.	Cytogenetics I.	Molecular genetics I.
7.	Cytogenetics II.	Midterm I (written)
8.	Autosomal inheritance I.	Molecular genetics II.
9.	Autosomal inheritance II.	Molecular genetics III.
10.	Role of sex in inheritance	Application of genetic methods in the study monogenic inheritance I.
11.	Genetics of sex	Application of genetic methods in the study monogenic inheritance II.
12.	Relationship of genom and environment. Complex inheritance	Complex inheritance
13.	Pharmacogenetics, -genomics	Midterm II.
14.	Gene and genom manipulation	Consultation

Important notes: see at Biology I.

Students having lecture and practice signature may give the final exam. Final exam is a written test

(multiple choice, essay, drawing etc. similar to midterms) covering practice and lecture parts of Biology I and II.

BIOPHYSICS I.

Tutor: ***Dr. Károly Módos***

First Semester

Lectures (2 hours per week)

Introduction; structure of matter; interactions
Gases, crystals, liquids, Boltzmann distribution
Properties of condensed matter
Liquid crystals, membranes
Structural organization of macromolecular systems
Radiations, light, optics
Wave and corpuscular nature of light
Light absorption and emission, light scattering, vision
Electromagnetic radiations, thermal radiation
Luminescence
Lasers

X-radiation
Ionizing radiations, radioactive decay

Dosimetry
Sound, ultrasound, hearing

Laboratory (3 hours per week)

Laboratory safety rules
Data processing
Emission spectroscopy. Light sources
Spectrophotometry
Optical lenses; light microscope

Detection of nuclear radiations
Oscilloscope
Radioactive power of an X-ray tube

Special light microscopes
Gamma energy determination
Electronic blood particle counting
Picoscale
Determination of skin-impedance
Concentration determination with refractometer
Isotope diagnostics
Repetition, consultation

BIOPHYSICS II.

Second Semester

Lecture (2 hours per week)	***Laboratory*** (3 hours per week)
Transport phenomena, flow of fluids and gases	U V-dosimetry
Diffusion, osmosis	Dosimetry
Thermodynamic aspects of transport processess	Amplifier
Laws of thermodynamics	The attenuation of gamma-radiation
Membrane potential	Pulse generators
Signals as information carriers, signal processing	Sine wave oscillators
Detectors, transducers, displays	Audiometry
Basic electronic units and circuits	Densitography (CT)
Physical methods for structural analysis I	Calculations
Physical methods for structural analysis II	Flow of fluids. Electric model of vascular
Regulatory system in technics and b	system
Some diagnostic methods, endoscopy,	Electrocardiography
thermography, ultrasound echo, Doppler, X-ray	
Isotope diagnostics	Diffusion
Magnetic resonance imaging	Sensory function
Some therapeutic methods, laser surgery,	Repetition
radiation therapy	
Research fields in the Department of	Repetition
Biophysics and Radiation Biology	

GENERAL AND INORGANIC CHEMISTRY I.

Lecturers: ***Dr. Béla Noszál, Dr. István Szalai***
Tutor: ***Dr. Krisztina Kurin-Csörgei***

First Semester

Elementary particles: quarks, leptons, gauge particles, electron, proton, neutron.

The Bohr model of the atom.
Properties of the electron. Heisenberg's uncertainty principle. Schrödinger's equation and the quantum numbers. Pauli's exclusion principle and Hund's rule.
Periodic table and periodic properties. Ionic bond and the types of ions.
Covalent bond and its representation in Lewis structures. Hybridization of orbitals. The valence bond theory.
Molecular geometry, the VSEPR theory. The formation of molecular orbitals.
Bond polarity and moleculepolarity. Single and multiple bonds.
Electronegativity and its determination. The ionic character of covalent bonds.
Covalent radius, bonding energy, network covalent bonds. Metallic bonding.
Weak bonding forces. Dispersion, dipole forces and hydrogen bonding.
Multicentered bonds.
Chemical equilibria, the law of mass action. Kp and Kc. The Le Chatelier principle. The temperature and pressure dependence of the equilibrium constant.
Acid/base equilibria. Conjugated acid-base pairs and their strengths.
The acid/base equilibria of water. The pH and its calculation. Strength of acids and bases. Hydrolysis. Buffer systems.
Complex formation equilibria. Types of ligands. Mass balance equations, calculation of complex equilibria. Heterogeneous equilibria, the solubility product constant, solubility.
Chemical kinetics. Reaction order and molecularity. First order reactions.
Age determinations based upon radioactive decompositions. Second order, pseudofirst order and zero order reactions. Reaction mechanisms.
The temperature dependence of the reaction rate, collision theory.
Catalysis. catalysts. Autocatalytic reactions. Enzyme catalysed, induced and oscillatory reactions.
Thermochemistry. Hess's law. Internal energy and enthalpy changes of reactions.
Entropy. Spontaneity of chemical reactions, the free energy. Coupled reactions and their spontaneity.
Photochemistry and radiation chemistry. States of matter. Properties and kinetic theory of gases. Properties of liquids. The surface tension. Freezing, boiling.
The phase diagram of water. Crystal structures, unit cell. The rate of crystallization. Sublimation.

The mechanism of dissolution. Types of concentrations. Rules of dilute solutions.
Determination of MM by colligative properties.

PRACTICAL GENERAL AND INORGANIC CHEMISTRY

First Semester

Lectures (4+1 hours per week)

Methods of purification of chemical substances. Recrystallization. Sublimation. Ion exchange. Distillation. Chemical purification. Preparation of inorganic compounds. Stoichiometry of chemical reactions. Theoretical yield, actual yield and per-cent yield. Types of chemical reactions. Acid-base reactions. Preparation of inorganic compounds by acid-base reactions. Acid-base properties of salt solutions, hydrolysis. Thermal decomposition of inorganic compounds (acids, bases, salts). magnesium metal sample. Oxidation-reduction reactions. Balancing redox equations. Preparation of inorganic compounds by

Practicals (5 hours per week)

Safety instructions. General instructions on the requirements. Recrystallization of $KA1(SO_4)_2$. 12 H_2O. Sublimation of iodine. Chemical purification of sodium chloride. Water purification using ion exchange resins. Distillation of hydrochloric acid. Preparation of $CuSO_4$. 5 H_2O

Preparation of $(NH_4)_2SO_4$, H_3BO_3 from borax ($Na_2B_4O_7$) Preparation of $CaHPO_4$. Observation of hydrolysis of some salts. Observation of thermal decompositions. Determination of the mass of a

Observation of some oxidation-reduction Reactions. Preparation of metallic copper and

oxidation-reduction reactions.

Complex formation reactions. Naming of complex ions and coordination compounds. Methods of preparation of double salts and coordination compounds.

Calculation of pH in solutions of acids and bases.
Buffer solutions and their functions, calculation of pH of buffer solutions.

Precipitation reactions. Equilibria in precipitation reaction.

Problem-solving in general chemistry. (Calculation of molar masses of nonelect-rolytes from colligative properties).

Problem solving in general chemistry (Electrochemistry)

metallic manganese.
Reactions of metals.
Preparation of Cu_2O and $FeSO_4$

Preparation of precipitated sulfur.
Experimental observation of direction of redox reactions (standard potentials).
Preparation of a double salt (Mohr salt, $(NH_4)_2$ $Fe(SO_4)_2$. 6 H_2O
Preparation of a buffer solutions.
Preparation of $Cu(NH3)_4$ SO_4 and Co $Hg(SCN)_4$ coordination compounds.
Qualitative comparison of solubility products.
Observation of osmosis.
Dependence of the reaction rate on concentration and temperature.
Observation of catalysis.
Decomposition of hydrogen peroxide.
Closing inventory. Problem-solving.

GENERAL AND INORGANIC CHEMISTRY II.

Lecturer: ***Dr. Zsuzsanna Nagy-Ungvárai***

Second Semester

3 hours per week (lecture)

Weeks ***Introduction***

1

The elemental composition of the Universe. Origins of the elements. The composition of the litosphere, hydrosphere and atmosphere. The evolution of the atmosphere. The classification of the elements: metals, nonmetals and metalloids. Trends in metallic and nonmetallic character.

2

Chemistry of hydrogen, oxygen, nitrogen and carbon.

Hydrogen: occurrence, preparation, chemical properties, uses. Binary hydrogen compounds (hydrides). Oxygen: occurrence, preparation, chemical properties, uses. Ozone. Peroxides, superoxides.

3

Nitrogen: occurrence, chemical properties. Hydrogen compounds of nitrogen. Oxides and oxyacids of nitrogen. The nitrogen cycle in nature. Carbon: elemental forms of carbon. Inorganic compounds of carbon. The carbon-oxygen cycle in nature.

4

Chemistry of other nonmetallic elements

The noble gases. (He, Ne, Ar, Kr, Xe, Rn) and their compounds. The halogens (F, Cl, Br, I, At): occurrences, preparation, properties and uses. Oxyacids and oxyanions. The biological role of halogens.

5

The group 6A elements (S, Se, Te). General characteristics, occurrences, preparation, properties. Oxides, oxyacids and oxyanions of sulfur and selenium. Sulfur and selenium in biology.

6

The group 5A elements (P, As, Sb, Bi). General characteristics, occurrences, preparation, properties. The oxycompounds of phosphorus. – The biological significance of the P–O bond. Silicon. The major element of the geosphere. Silicates. Clay minerals. Glass. – A comparison of the properties of carbon and silicon. Boron and its compounds.

Metals

7

Occurrence and distribution of metals. Metallurgy. The physical and chemical properties of metals and alloys. The alkali metals (Li, Na, K, Rb, Cs). General characteristics. Some important compounds of sodium and potassium.

8

The alkaline earth metals (Be, Mg, Ca, Sr, Ba). General characteristics. Some important compo unds of magnesium and calcium. The zinc-group metals (Zn, Cd, Hg). Occurrences, chemical properties.

9

The transition metals. Physical properties, electron configurations and oxidation states. The chemistry of selected transition metals: chromium, manganese, iron, copper, molybdenum, platinum.

Chemistry of coordination compounds

10
The structure of complexes. Types of ligands. Chelates. Isomerisms. Bonding in complexes. The magnetic and optical properties of complexes.

11
The dynamics of coordination compounds: Complex equilibria, ligand exchange rates. The coordination chemistry of alkali metal ions. (Hostguest complexation.)

Metals in biology

12
Life essential metals and ligands in biosystems. Metals in enzymatic and trigger processes. Metals in oxygen and nitrogen biochemistry.

13
Metals in biomineralization. Metal-induced toxicity. The biomedical use of metal complexes and metal complexation.

The chemistry of the environment

14 A brief overview of the chemistry of the litosphere, hydrosphere and atmosphere.

ANALYTICAL CHEMISTRY I.

Qualitative Chemical Analysis

Lecturer: ***Dr. István Szalai, Dr. Norbert Szoboszlay***
Practical: ***Dr. István Szalai, Dr. Norbert Szoboszlay***
Tutor: ***Dr. Krisztina Kurin-Csörgei***

Second Semester

Lectures (2 hours per week)

Subject and aims of analytical chemistry. Analytical chemistry and other sciences. Qualitative and quantitative chemical analysis. Chemical and physical methods of analysis. The characterization of analytical reactions. Specificity, selectivity and sensitivity of analytical reactions. Requirements for qualitative chemical

Practicals (5 hours per week)

General rules of work in the laboratory of analytical chemistry. Study of reactions of Group I cations. Part I: Bi^{3+}, Pb^{2+}, Cd^{2+}. Study of reactions of Group I cations. Part II: Hg_2^{2+}, Hg^{2+}, Ag+, Cu^{2+}. Identification of cations in mixture

reactions. Separation and identification of ions.
Analytical classification of cations. Group reactions of cations. Analytical groups and periodic table of the element. Summary of properties of elements and reactions of Group I cations.
Ion reactions in aqueous solution. Acidbase reactions. Thioamphoterism. Summary of properties of elements and reactions of Group II cations.
Complex formation reactions. Complex equilibria. Pearson classification of acids and bases.
Precipitation reactions. Equilibria in cations. precipitation reactions. Solubility and pH. Precipitation and solubilities of metalsulfides. group of cations.
Summary of properties of elements and reactions of Group III cations.
Solubility and complex ion equilibria and application in qualitative analysis of ions.

Summary of properties of elements and reactions of Groups IV–V cations. Flame tests. Atomic spectroscopic methods of qualitative analysis.
Classification of anions into analytical groups. Group reagents for qualitative analysis of anions.
Oxidation-reduction.
Oxidation-reduction reactions in qualitative chemical analysis.

of Group I cations.
Study of ion reactions of Group II cations: As/III/, /V/, Sb/III/, /V/, Sn/II/, /V/.

Analysis of Group I cation in unknown samples. Identification of the second group of cations in mixtures.

Study of ion reactions of Group III cations.
Part I: Co^{2+}, Ni^{2+}, Fe^{2+}, Fe^{2+}, Cr^{3+}.
Study of ion reactions of Group III
Part II: Al^{3+}, Mn^{2+}, Zn^{2+}. Analysis of unknown mixture of the third analytical

Study of ion reactions of Groups IV–V cations.
Analysis of Group III cations in unknown samples. Detection of cations in the mixture of the fourth and fifth analytical groups of cations.
Analysis of unknown samples containing cations of the Groups I–V.
Study of reactions of the first analytical group anions.
Study of reactions of the second and third analytical groups of anions.

Study of reactions of the fourth group of anions.
Identification of anions in the mixture of Groups I–IV anions.

Summary of reactions of common anions.	Special tests for mixture of anions.
Lectures (2 hours per week)	***Practicals*** (5 hours per week)
Analysis of cation-anion solution sample. Preliminary and specific tests.	Analysis of cation anion unknown solution sample (3–5 ions).
Analysis of cation-anion unknown solid sample. General procedure for chemical analysis.	Analysis of cation anion unknown solid samples (3–5 ions).
Physical methods of qualitative analysis.	Analysis of unknown simple substances.

PHARMACEUTICAL BOTANY I.

Department of Plant Anatomy
Tutor: ***Dr. Gábor Kovács***

Second Semester

Week	***Lectures***	***Practicals***
1	Introduction. The Plant Kingdom. The botanical sciences. Pharmaceutical Botany, the program of the lectures.	Fundamentals in Botany. The use of the light microscope. Knowledge of the medicinal plants
2	Compartmentalization and metabolic pathways in plant cells.	Plant cells (plasmolysis, cycloses).
3	Chloroplast and photosynthesis. Starch formation and degradation.	Plastids, reserve polysaccharides, protein bodies.
4	Synthesis of cell wall polysaccharides. Cell wall formation and architecture. Plasmodesmata. Mucilage synthesis and the dynamics of hydrophilic secretion.	Cell wall, structural polysaccharides and other wall substances.
5	Mitochondrion and respiration.	Vacuole, crystals, lipid bodies.

6	Lipid metabolism. Fatty acid polymers: cutin, suberin. Wax. Terpenoids. The lipophilic secretion.	1st Test Work. Stem morphology (buds). Monocots: analysis of a living plant.
7	Amino acid and protein metabolism. The N cycle. Protein bodies, protein mobilization. Protein secretion.	Analysis of dicots representing ancestral type (Ranunculaceae).
8	Formation of alkaloids and phenolics. Lignification. Vacuole, cell sap, osmoregulation, crystal formation, autophagy, autolysis.	Simple tissues, meristems.
9	Nucleic acid metabolism. The nucleus. Plant specificities of mitosis and meiosis.	Dermal tissue system, trichomes.
10	Organizational types of plants. The cormophyte plant body. Tissues, tissue system. Meristems.	2nd Test Examination Analysis of living plants (Rosaceae, Apocynaceae), medicinal plants.
11	Dermal tissue system.	Conductive tissue system.
12	Conductive tissue system.	Ground tissue system.
13	Ground tissue system.	Analysis of living plants (Papaveraceae, Primulaceae).
14	Secretory structures.	3 Test Work Knowledge of the medicinal plants. Pteridophyta.

A visit to Research Institute for Medicinal Plant (Budakalász) by coach, to study the chemotaxonomic plant collection. Field practice in the mountains near to Budapest to study the springtime blossoming medicinal plants.

ANATOMY

Tutor: ***Dr. Ágnes Csáky***

Second Semester

The aim of the subject is to introduce to the fundamentals of the structure of the human body and by this teach the essential terms used in the communication between pharmacists and physicians. The topic anatomy also serves as a preliminary study for later clinical subjects and deals with the basic methods of morphological research. The programme refers to anatomical books and periodicals helping the pharmacists to complete their

knowledge in necessary.

Lecture	*Practice*	
1	Introduction, general Embryology	Microscopy: stratified epithelium,
2	Basic tissue	connective tissue, cartilage, bone
3	Bone, joint and muscle types	Macroscopy: bones and joints of the
4	Ossification, development of the vertebral column	shoulder girdle and upper limb
5	Heart and its development	Microscopy: artery and vein, blood,
6	Blood vessels	lymphe node spleen, palatine, tonsil
7	Blood, development of the blood cells	Macroscopy: bones and joints of the
8	Lymphatic organs	pelvis girdle and lower limb
9	Respiratory system	Microscopy: lung, submandibular gland,
10	Development of lung and intestines	liver, pancreas
11	Intestinal tract.	Macroscopy: vertebral column and skull
12	Digestive glands	
13	Kidney	Microscopy: stomach ileum, kidney,
14	Ureter, urinary bladder, urethra	ureter
15	Inner and outer genitals	Macroscopy: muscles, vessels and
16	Development of the urogenital organs	nerves of the upper limb.
17	Endocrine gland	Microscopy: ovary, uterus, placenta,
18	Development of the nervous system	testis, penis
19	Spinal cord.	Macroscopy: muscles, vessels and
20	Oblongate medulla, pons, mesecephalon	nerves of the lower limb.
21	Diencephalon, neurosecretion	Microscopy: hypophysis, thyroid, adrenal
22	Cerebral cortex	gland, cerebellum, spinal cord.
23	Cerebellum, extrapyramidal system	Macroscopy: intestinal complex
24	Olfactory and limbic systems	
25	Eye, optic tracts and centers	Microscopy: eye, organ of Corti
26	Auditory and static system	
27	Gustatory buds, skin and accessory organs	Macroscopy: brain and spinal cord.

28 Development of the sensory organs
29–30 Repetition, complementary day for holidays

HISTORY OF SCIENCES, PROPEDEUTICS

University Pharmacy, Department of Pharmacy Administration
Lecturer: ***Prof. Dr. Ágnes Kéry***
Tutor: ***Dr. Anna Sólyomváry***

First Semester

Week ***Lectures*** (2 hours per week)

1 The place and importance of the subject in the curriculum.
Profession's history as bridge, methods, main fields.
Symbols of medicine and pharmacy.
2 Knowledge of medicine and pharmacy in Babylonia-Assyria.
Knowledge of medicine and pharmacy in Egypt.
3 Knowledge of medicine and pharmacy in Greece. Hippocratic medical writing.
Knowledge of medicine and pharmacy in Rome. Galen.
4 The Arabs and the European Middle Ages. Transit ways of knowledge.
Monastic medicine and pharmacy. The School of Salerno.
Universities emerge, the birth of European professional pharmacy.
5 The idea of renaissance. Paracelsus and chemical drugs.
Homeopathy as an example of medical sectarianism.
6 Development of pharmacy in Italy and France.
Development of pharmacy in Germany and Britain.

7 Development of Pharmacy in Hungary.
8 Pharmaceutical education in Europe. Development of education.
9 Definition of drugs. Aspects of classification.
Classification of drugs according to their origin and on the basis of strength.
10 Classification of drugs by their pharmaceutical action, use and by the place of application.
Drug and doses. Specially named doses.
11 Drug utilization. How could be influenced the increased drug consumption?
Drug abuse. Prevention of drug abuse.
Narcotic controls.
12 International professional trends. F.I.P., I.P.S.F.. Unification of drug standards.
Pharmaceutical literature: treatises, pharmacopeias, formularies, journals, periodicals.
13 Ordering of drug preparation. Pharmacy, galanic laboratories, pharmaceutical factories.
14 Pharmacists, connections with physicians, etc.
Health for all – all for health.

FIRST AID

Department of Traumatology
Head of Department: ***Prof. Dr. László Hangody***
Tutor: ***Dr. Tamás Gál***

Type of subject: Mandatory

Second Semester

Purpose of subject:
First aid is the provision of initial care for an illness or injury. It is usually performed by a lay person, until definitive medical treatment can be accessed. It generally consists of a series of simple and, in some cases, potentially life-saving techniques that an individual can be trained to perform with minimal equipment. All students who graduate from Semmelweis University, including pharmacists should have a knowledge of how to provide basic first aid to an injured or ill person.
The duty of care is the legal duty owed by one person to another to act in a certain way. As a first aider, you have a duty of care towards your casualties to exercise reasonable care and skill in providing first aid treatment. The duty arises because you have knowledge and skills relevant to a medical emergency situation.
The goal of first aid is to preserve life, prevent further harm, and to promote recovery.

Syllabus (weekly schedule):

1. Cardio-pulmonary resuscitation (CPR)
2. Bandaging methods
3. Mechanical injuries (fractures)
4. Bleeding and its control
5. Sport injuries
6. Thermal injuries
7. Shock
8. First aid in internal medicine
9. Respiratory diseases
10. Multiple casualty accident: organization and transport
11. Unconscious patient
12. Internal bleeding

Following the Cardio-pulmonary resuscitation (CPR) lecture, simultaneously during the lectures, a group of students will perform CPR practices on CPR manikins. Students will have the opportunity to learn the following: physical examination of injured patients, bandaging, providing first aid in cases of sport, mechanical, thermal injuries, how to treat a bleeding wound, respiratory diseases, shock, unconscious patient and internal bleeding. The student will have an understanding of the Hungarian Paramedic Services, organization and transportation. Students have the opportunity for the consultation of the typical and the more frequent first aid cases during the interactive lectures and practices.

Attendance: During the course of the semester, three absences are allowed.

Verification of absences:
We can only accept hospital discharge papers for verification of more than three absences from lectures, proving the student was continuously

hospitalized during that time period.

Mid-semester test and quiz topics, dates, absences and retaking of these tests:
There will be no tests or quizzes during the semester, nor at the end of the semester.

Criteria for the signature at the end of the semester: Attendance of lectures is required.

INTRODUCTION TO HEALTH INFORMATICS I.

Name of the educational organizational unit: SE EKK Institute of Digital Health Sciences
Name of the subject: Introduction to health informatics I.
Type of the subject: 1 theory, 1 practice / week
code: GYINFBEIE1A (theory), GYINFBEIG1A (practice)
credit value: 2 (theory), 0 (practice)
Name of the lecturer of the subject: ***Dr. Miklós Szócska***
Teachers: Dr. Ádám Zoltán Tamus (PhD, assistant lecturer)
Dr. Gergely Zajzon (assistant lecturer (a PhD student))
Tamás Tóth (assistant lecturer (a PhD student))
Péter Dombai (assistant lecturer (a PhD student))
Zoltán Sándor (assistant lecturer (a PhD student))
Term: autumn

The exercise of the subject in the in the realization of the aim of the education:
To introduce the students to the medical application of informatics, the characteristics of modern, integrated information systems with respect to quantitative aspects and to decision demands of the modern sciences. The medical informatics leans on methods of mathematics, statistics and computer sciences and it also includes from the different engineering, management and informatics procedures.

Topics of the subject:
Topic of the theoretical lectures (broken down into weekly figures): 2×7 lectures = 14 lectures
1. Introduction: disruptive technologies in the healthcare
2. Medical data – definitions, their collection and use on the individual and population level
3. Medical information on the Internet
4. Informatics background of the ambulance care – mobilcommunication
5. The background of basic healthcare informatics – integrated healthcare systems
6. The active aging – lifestyle supported by informatics

7. The IT tasks of health care experts

Topic of the practical practices (broken down into weekly figures): 2×7 practices = 14 practices

Application of MS Excel in the pharmacist practice (functions, diagrams, advanced level)	4×2 lessons
Application of MS Word in the pharmacist practice	2×2 lessons
Execution of individual complex exercise	1×2 lessons

Requirements of participation of the lessons and the possibility of substitution of the absence:
According to rules of the Studies and Exam Code. The absence can be excused by the presentation of a medical certificate. Substitution is possible according to a discussion with the teacher.

The mode of the certificate in case of absence from the lessons and from the exams:
According to rules of the Studies and Exam Code.

The number, the topic, the time, the possibility of the substitution and improvement of checking during the term:
Acceptable solution of individual exercises.

The requirements of signature at the end of the term (including also the number and the type of the students' exercises which are solved individual by them):
Suitable percentage of participation.

The mode of acquisition of the mark:
Exam: solution of a computer test (five-grade valuation).
Practice: three-grade valuation.

Type of the exam:
Colloquium.

Exam requirements:
Exam: solution of a computer test (five-grade valuation).

Mode of the application for the exam:
Via Neptun system.

Order of the modification of exam application:
According to Studies and Exams Code.

Mode of the certification in case of absence from the exam:
By a medical certification within three days.

List of lecture notes, course books, study-aids and literature which can be used to acquisition of the syllabus:
The use of educational materials on the institute website is obligatory: www.semelweis.hu/dei

Recommended literature:
1 Kékes-Surján-Balkányi-Kozmann: Egészségügyi informatika, Medicina Könyvkiadó, 2000 ISBN 9632423410
2 Dinya Elek (szerk.): Humán gyógyszerfejlesztés, Medicina Könyvkiadó Zrt, 2006 ISBN 9632429982
3 Meskó Bertalan: The Guide to the Future of Medicine, Webicina 2014 ISBN 9789631200072

INTRODUCTION TO HEALTH INFORMATICS II.

Name of the educational organizational unit: SE EKK Institute of Digital Health Sciences
Name of the subject: Introduction to health informatics II.
Type of the subject: 1 theory, 1 practice / week
code: GYINFBEIE2A (theory), GYINFBEIG2A (practice)
credit value: 2 (theory), 0 (practice)
Name of the lecturer of the subject: ***Dr. Miklós Szócska***
Teachers: Dr. Ádám Zoltán Tamus (PhD, assistant lecturer)
Dr. Gergely Zajzon (assistant lecturer (a PhD student))
Tamás Tóth (assistant lecturer (a PhD student))
Péter Dombai (assistant lecturer (a PhD student))
Zoltán Sándor (assistant lecturer (a PhD student))
Term: spring

The exercise of the subject in the in the realization of the aim of the education:
To introduce the students to the medical application of informatics, the characteristics of modern, integrated information systems with respect to quantitative aspects and to decision demands of the modern sciences. The medical informatics leans on methods of mathematics, statistics and com-

puter sciences and it also includes from the different engineering, management and informatics procedures.

Topics of the subject:
Topic of the theoretical lectures (broken down into weekly figures): 2×7 lectures = 14 lectures
1. IT tools related to the lifecycle of medicines
2. Informatics of medicine planning – molecular modelling
3. Clinical evidences – Scientific proofs and their data sources
4. Informatics of medicine-licencing
5. Medicine-data and -databases on the Internet
6. Functions of pharmacy software
7. Telemedicine and pharmaceutics – mobile phone applications connected with medicine

Topic of the practical practices (broken down into weekly figures): 2×7 practices = 14 practices
Database management (PuPha (MS Access)) 3×2 lessons
Practice with data representation and data visualisation
(MS Powerpoint, Prezi) 3×2 lessons
Execution of individual complex exercise 1×2 lessons
Requirements of participation of the lessons and the possibility of substitution of the absence:
According to rules of the Studies and Exam Code. The absence can be excused by the presentation of a medical certificate. Substitution is possible according to a discussion with the teacher.

The mode of the certificate in case of absence from the lessons and from the exams:
According to rules of the Studies and Exam Code.

The number, the topic, the time, the possibility of the substitution and improvement of checking during the term:
Acceptable solution of individual exercises.

The requirements of signature at the end of the term (including also the number and the type of the students' exercises which are solved individual by them):
Suitable percentage of participation.
The mode of acquisition of the mark:
Exam: solution of a computer test (five-grade valuation).
Practice: three-grade valuation.

Type of the exam:
Colloquium.

Exam requirements:
Exam: solution of a computer test (five-grade valuation).

Mode of the application for the exam:
Via Neptun system.

Order of the modification of exam application:
According to Studies and Exams Code.

Mode of the certification in case of absence from the exam:
By a medical certification within three days.

List of lecture notes, course books, study-aids and literature which can be used to acquisition of the syllabus:
The use of educational materials on the institute website is obligatory: www.semelweis.hu/dei

Recommended literature:
1 Kékes-Surján-Balkányi-Kozmann: Egészségügyi informatika, Medicina Könyvkiadó, 2000 ISBN 9632423410
2 Dinya Elek (szerk.): Humán gyógyszerfejlesztés, Medicina Könyvkiadó Zrt, 2006 ISBN 9632429982
3 Meskó Bertalan: The Guide to the Future of Medicine, Webicina 2014 ISBN 9789631200072

TERMINOLOGY (1st semester)

Responsible organisational unit:
Faculty of Health Sciences, Division of Foreign Languages and Communication
Programme director: ***Zöldi Kovács Katalin PhD***, Head of the Division
2 lessons per week, 2 credits
Assessment: 3 written tests

Role of subject in fulfilling the aim of training:
Students get familiarized with the Latin and Greek terminology of medicine in order to facilitate the acquisition of other subjects. Special focus is dedicated to anatomy, physiology, pathology and pharmaceutics. Furthermore, the course provides an introduction into general scientific terminolo-

gy.
Brief description of subject:
The main aim of the subject is:
1.
to acquire a knowledge of about 500-600 Latin words and phrases as a minimum vocabulary (basic vocabulary of medical and scientific language),
2. the correct application of
   a) anatomical names,
   b) names of diseases
   c) names of drugs,
3. to understand diagnoses and prescriptions;
4. to learn about abbreviations used in prescriptions.
5. to be able to make a clear distinction between medical terms of English and Latin/Greek.

Course content of practical lessons:
1. Grammar**:**
   Nouns: the 5 Declensions

Adjectives - construction of the most important attributive structures with the vocabulary of anatomy, clinical subjects and of pharmaceutics.
   Prepositions (in anatomical, clinical and pharmaceutical phrases)
   Numerals: Usage on prescriptions.
2. Texts containing**:**
   a) anatomical names;
   b) clinical and patho-anatomical diagnoses;
   c) prescriptions
3. Vocabulary

Latin and bilingual (Greek-Latin) nouns, adjectives, numerals and prepositions used in anatomy, the clinical subjects and pharmaceutics;
Course material, recommended text book(s), professional literature and supplementary reading(s)
Belák E. *Medical Terminology for Beginners* (earlier title: *Medical Latin*), Budapest: Semmelweis Kiadó.

Basics of Foreign Language (module 1.)

Magyar orvosi szaknyelv 1.
Responsible organisational unit:
Faculty of Health Sciences, Division of Foreign Languages and Communication
Programme director:
Zöldi Kovács Katalin PhD, Head of the Division

4 lessons per week, 4 credits

Assessment: end-term written and oral exam

Role of subject in fulfilling the aim of training:
The role of this subject is to help students acquire the basic vocabulary, grammar and language skills they need for the effective communication in the language they use during their field practice both in their everyday life /'survival language'/ and in their academic studies. Raising students' awareness of cultural differences is one of our top priorities.
Brief description of subject:
The first three modules are dedicated to learning basic general vocabulary and grammar. In the first module students acquire basic structures and the vocabulary for everyday topics / e.g. shopping, food, housing etc./, language for „survival.". The course places special emphasis on phrases essential for everyday communications, e.g. introductions, greetings, getting/giving information etc. Grammar is of less importance in this phase of language studies.

Course content of practical lessons:
Lesson 1-2: The alphabet
Lesson 3-4: Greetings
Lesson 5-6: Where are you from?
Lesson 7-8: Introducing people
Lesson 9-10: Numbers-phone numbers
Lesson 11-12: What time is it?
Lesson 13-14: Practising telling the time
Lesson 15-16: Days
Lesson 17-18: When do you study?
Lesson 19-20: What is it? - food

Lesson 21-22: Consolidation
Lesson 23-24: Test 1 + situations
Lesson 25-26: What is the food like? - adjectives
Lesson 27-28: What do you think of English tea?- giving opinions
Lesson 29-30: I would like a tea
Lesson 31-32: Shopping for food
Lesson 33-34: Ordering food- in a café
Lesson 35-36: Rooms in the flat
Lesson 37-38: Furniture in the rooms
Lesson 39-40: Where are the furniture?
Lesson 41-42: As a guest
Lesson 11-12: At a party
Lesson 43-44: Where can I find the library?
Lesson 45-46: When shall we meet?
Lesson 47-48: Asking for information, setting programs
Lesson 49-50: Places in the city
Lesson 51-52: Consolidation
Lesson 53-54: Test 2 + situations and communication practice
Lesson 55-56: Assessment

Course material, recommended text book(s), professional literature and supplementary reading(s)
Gyöngyösi Lívia - Hetesy Bálint. *Hungarian language: Jó reggelt!* Semmelweis Egyetem Egészségtudományi Kar, 2010.

Basics of Foreign Language (module 2.)

Magyar orvosi szaknyelv 2.

Responsible organisational unit:
Faculty of Health Sciences, Division of Foreign Languages and Communication
Programme director: ***Zöldi Kovács Katalin PhD***, Head of the Division

4 lessons per week, 2 credits,

Assessment: midterm (written) and endterm (written and oral) tests

Role of subject in fulfilling the aim of training:
The role of this subject is to help students acquire the basic vocabulary, grammar and language skills they need for the effective communication in the language they use during their field practice both in their everyday life /'survival language'/ and in their academic studies. Raising students' awareness of cultural differences is one of our top priorities.

Brief description of subject:
The first three modules are dedicated to learning basic general vocabulary and grammar. In the second module students acquire basic structures and the vocabulary for everyday topics (e.g. family, relatives, at the doctor's etc.) language for survival.". The course places special emphasis on phrases essential for everyday communications, e.g. likes, dislikes, offering help, etc. Grammar is of less importance in this phase of language studies.

Course content of practical lessons:
Lesson 1-4: Forming questions
Lesson 5-6: Plural forms
Lesson 7-8: What do you like doing in your free time?
Lesson 9-10: I would like to……
Lesson 11-12: Communication skills
Lesson 13-14: A date – what do you like?
Lesson 15-16: I like dancing, swimming etc.
Lesson 17-18: I can ride a bike, drive etc.
Lesson 19-20: Communication practice
Lesson 21-22: Can I help you? In a clothes shop
Lesson 23-24: Can I give you something else?
Lesson 25-26: Communication practice
Lesson 27-28: Consolidation
Lesson 29-30: Test 1 + situations
Lesson 31-32: I have a headache- at the doctor
Lesson 33-34: At the chemist's
Lesson 35-36: Communication practice- at the doctor, at the chemist's
Lesson 37-38: My family, family members
Lesson 39-40: Family relations
Lesson 41-44: Communication practice- introducing your family
Lesson 45-48: My boss' wife – social relations

Lesson 49-50: Consolidation
Lesson 51-54: Test 2 – situations, communication practice
Lesson 55-56: Assessment

Course material, recommended text book(s), professional literature and supplementary reading(s)
Gyöngyösi Lívia – Hetesy Bálint. *Hungarian language: Jó napot kívánok!* Semmelweis Egyetem Egészségtudományi Kar, 2011.