CHAPTER 5
BASIC MEDICINE COURSE

BASIC MEDICINE COURSE-INTRODUCTION TO BIOLOGY

Nagyerdei krt. 98., Debrecen, 4032
Web: www.bmc.unideb.hu

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Course Coordinator	Ms.	Beáta Lontay M.Sc., Ph.D.
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		Gergely Buglyó M.D., Ph.D.
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	Ms.	Krisztina Deák-Pocsai M.Sc., Ph.D.
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BASIC MEDICINE COURSE-INTRODUCTION TO BIOPHYSICS

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BASIC MEDICINE COURSE-INTRODUCTION TO MEDICAL CHEMISTRY

Nagyerdei krt. 98., Debrecen, 4032
Web: www.bmc.unideb.hu

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Ms. Beáta Lontay M.Sc., Ph.D.

László Virág M.D., Ph.D., D.Sc.

CHAPTER 10
ACADEMIC PROGRAM FOR THE BASIC MEDICINE COURSE

Basic Medicine Course (BMC, Premedical Studies)
Duration of studies: 1 year (2 semesters)

The one-year premedical Basic Medicine Course is recommended to those students who do not have sufficient knowledge in Biology, Physics and Chemistry from high school. The requirements in these premedical science subjects are rigorous, thus it is recommended that students who need a period of preparation prior to beginning the General Medicine, Dentistry or Pharmacy Program join the Basic Medicine Course. Students successfully completing the course are directly admitted to their chosen program. In addition to the Basic Medicine Course starting each September, our University launches an Intensive BMC in January as well.

Class Behavior

Students must not use cell phones to talk or text during class. Cell phones must be switched off or kept in silence mode during class. In seminars, students will be expected to participate in seminar discussions. Students are encouraged to ask questions related to the topic of the lectures discussed, and participate in solving problems related to the topic of the seminar. Some professors will ask for students to volunteer information, but some professors call on students randomly. It is, thus, a good idea to come to class prepared so as not to be embarrassed in front of the class. Students should not disrupt the class by talking to each other. If one continues to disrupt the class, the student may be asked to leave. The usage of electronic devices, textbooks and any form of interaction between students during the tests is strictly forbidden. Electronic devices (cell phones, tablets, dictionaries, etc.), except for approved simple calculators, must not be within the reach (in pocket, in the desk, etc.) of students during tests. It is the students' responsibility to stow these items before the test begins without specific warning by the supervising teachers. Violation of these above mentioned regulations results in an immediate and unconditional dismissal from the program.

Requirements

The 2-semester course consists of lectures and seminars. Attending lectures is strongly recommended, attendance of seminars is compulsory and recorded. Everyone must attend the seminars with the group designated by the Registrar's Office.

Absence can significantly affect your understanding and can have serious implications of progression in your studies. One might have a maximum of three seminar absences per semester to have the opportunity to get exemption. Students missing 4 seminars per semester cannot be exempted from the End of Semester Examination (ESE) or Final Examination (FE), regardless of their score reached on the Self Control Tests. Students missing 5 or more seminars per semester are dismissed from the course. Missed seminars cannot be made up, unless one obtains prior permission to be absent.

The knowledge of students will be tested 4 times during each semester using a written test system by **Self Control Tests (SCT).** The first semester is ended with an **End of Semester Examination** (ESE) covering the topics of all lectures and seminars of the first semester. Three dates will be set for the ESE during the winter examination period. Unsuccessful students may repeat the ESE twice (B and C chances). Students repeating the course must successfully pass the first semester either with exemption or at least with a score of 60% of ESE, otherwise their studies will be terminated. The ESE is not compulsory for non-repeater students and even who fail may continue their study in the second semester, however, they lose their chance to receive bonus points. Exam exemptions and bonus point policy are to improve the students' performance on SCTs and give them a chance to get exemption of the FE (described below) even with SCT scores lower than 40% in the first semester. Exact details of the exemption of ESE:

-one's average score of the three best first semester SCTs is at least 70%, AND
-(s)he successfully completed all the SCTs at least with 30% score, AND
-(s)he has a maximum of 3 seminar absences for each subject in the first semester.

The course ends with a **Final Exam (FE)** covering the whole material of the first and second semesters. A minimum of four FE dates will be set during the summer examination period. Unsuccessful students may repeat the FE twice (B and C chances, and the latter ends up with an oral examination part). Exemption from FE is offered for students who achieve excellent academic performance during their studies on the following base:
-the average score of the six best SCTs (out of 8) of the two semesters is at least 70%, AND
-passed all the SCTs with at least 30%, AND
-(s)he has a maximum of 3 seminar absences for each subject per semester.
OR
-the average of the ESE score taken 3 times plus the scores of the 3 best SCTs in the 2nd semester is at least 70%, AND
-passed all the SCTs with at least 30% in the 2nd semester, AND
-(s)he has a maximum of 3 seminar absences for a given subject per semester.
Bonus points will be added to the FE score (in %) of eligible students and calculated as follows:

The average of the ESE score three times and the best 3 2nd semester SCTs **OR** the average of the best 6 SCTs	Bonus points (%)
45.00-49.99	2
50.00-54.99	4
55.00-59.99	6
60.00-64.99	8
65.00-69.99	10

Students who could not meet the above described conditions for exemption during the two semesters must sit for the FE from the whole material of the first and second semesters. The participation shall be preceded by ID confirmation (i.e. student's card, passport or driving license) before all forms of tests.
Self Control Tests, End of Semester Exams, and Final Exams will be assessed as follows.

Percentage (%)	**Mark**
0 - 59.99:	fail (1)
60.00 - 70.00:	pass (2)
70.00 - 79.99:	satisfactory (3)
80.00 - 89.99:	good (4)
90.00 - 100:	excellent (5)

Absence for any reason counts as 0%.

Course coordinator: Dr. Beáta Lontay, Department of Medical Chemistry

Subject: **INTRODUCTION TO BIOLOGY I.**

Year, Semester: Basic Medicine Course, 1st
Number of teaching hours:
Lecture: **56**
Seminar: **28**

1st week:
Lecture:
The chemistry of life 1
Proteins, carbohydrates and lipids 1.
Proteins, carbohydrates and lipids 2.
Proteins, carbohydrates and lipids 3.

2nd week:
Lecture:
Proteins, carbohydrates and lipids 4.
Nucleic acids
Cells: the working units of life 1.Prokaryotes*
Cells: the working units of life 2.

3rd week:
Lecture:
Cells: the working units of life 3.
Cells: the working units of life 4.
Cells: the working units of life 5.
Cell membranes 1.

4th week:
Lecture:
Cell membranes 2.
Cell membranes 3.
Cell membranes 4.
Energy, enzymes and metabolism 1.

5th week:
Lecture:
Energy, enzymes and metabolism 2.
Energy, enzymes and metabolism 3.
Energy, enzymes and metabolism 4.
Pathways that harvest chemical energy 1.

6th week:
Lecture:
Pathways that harvest chemical energy 2
Pathways that harvest chemical energy 3.
Pathways that harvest chemical energy 4.
Pathways that harvest chemical energy 5.

7th week:
Lecture:
Cellular signaling and communication 1.
Cellular signaling and communication 2.
Cell cycle and cell division 1.
Cell cycle and cell division 2.

8th week:
Lecture:
Cell cycle and cell division 2.
Cell cycle and cell division 2.
Inheritance, genes and chromosomes 1.
Inheritance, genes and chromosomes 2.

9th week:
Lecture:
Inheritance, genes and chromosomes 3.
Inheritance, genes and chromosomes 4.
Inheritance, genes and chromosomes 5.
Inheritance, genes and chromosomes 6.

10th week:
Lecture:
Inheritance, genes and chromosomes /Pop. Gen 7
DNA and its role in heredity 1.
DNA and its role in heredity 2.
DNA and its role in heredity 3.

11th week:
Lecture:
From DNA to protein: gene expression 1.
From DNA to protein: gene expression 2.
From DNA to protein: gene expression 3.
From DNA to protein: gene expression 4.

12th week:
Lecture:
From DNA to protein: gene expression 4.
From DNA to protein: gene expression 5.
Gene mutation and molecular medicine 1.
Gene mutation and molecular medicine 2.

13th week:
Lecture:
Gene mutation and molecular medicine 3.

Gene mutation and molecular medicine 4.
Regulation of gene expression 1. (Prokaryotic reg.)
Regulation of gene expression 2. (Eukaryotic reg.)

14th **week:**
Lecture:
Regulation of gene expression 3.(Eukaryotic reg.)
Regulation of gene expression 4. (Eukaryotic reg.)
The mechanism of evolution 1.
The mechanism of evolution 2.

Contact person: Dr. András Penyige, Associate Professor, Department of Medical Genetics
Recommended book: Sadava-Hillis-Heller-Berenbaum: Life, Sinauer-Macmillam

Subject: **INTRODUCTION TO BIOLOGY II.**
Year, Semester: Basic Medicine Course, 2nd
Number of teaching hours:
Lecture: **42**
Seminar: **28**

1st **week:**
Lecture:
Tissues, Organs and Organ Systems 1.
Tissues, Organs and Organ Systems 2.
Tissues, Organs and Organ Systems 3.

2nd **week:**
Lecture:
Homeostasis and cellular physiology.
Temperature Regulation.
Blood, a fluid tissue 1.

3rd **week:**
Lecture:
Blood, a fluid tissue 2.
Circulation1.
Circulation 2.

4th **week:**
Lecture:
Circulation 3.
Circulation 4. The lymphatic system.
Natural Defenses against Disease 1.

5th **week:**
Lecture:
Natural Defenses against Disease 2.
Natural Defenses against Disease 3.
Nutrition, Digestion and Absorption 1.

6th **week:**
Lecture:
Nutrition, Digestion and Absorption 2.
Nutrition, Digestion and Absorption 3.
Nutrition, Digestion and Absorption 4.

7th **week:**
Lecture:
Respiratory system 1.
Respiratory system 2.
Salt and Water Balance and Nitrogen Excretion 1.

8th **week:**
Lecture:
Salt and Water Balance and Nitrogen Excretion 2.
Hormones 1.
Hormones 2.

9th **week:**
Lecture:
Hormones 3.
Hormones 4.
Hormones 5.

10th **week:**
Lecture:
Neurons and Nervous system 1.
Neurons and Nervous system 2.
Neurons and Nervous system 3.

11th **week:**

Lecture:
Neurons and Nervous system 4.
Neurons and Nervous system 5.
Sensory systems 1.

12**th week:**
Lecture:
Sensory systems 2.
Musculoskeletal Systems 1.
Musculoskeletal Systems 2.

13**th week:**
Lecture:
Musculoskeletal Systems 3.
Reproduction and Development 1.
Reproduction and Development 2.

14**th week:**
Lecture:
Reproduction and Development 3.
Reproduction and Development 4.

Contact person: Dr. Norbert Szentandrássy, Department of Physiology
Recommended book: Sadava, Hills, Heller, Berenbaum: Life (10th edition)

Subject: **INTRODUCTION TO PHYSICS I.**
Year, Semester: Basic Medicine Course, 1st
Number of teaching hours:
Lecture:56
Seminar: 28

1**st week:**
Lecture:
Introduction, requirements. Standards of length, mass, time. Significant figures. Prefixes. Conversion of units. Coordinate systems, trigonometry.
Radians, vectors and scalars, geometry, equation solving, problem solving, graphing. Functions, calculator usage

2**nd week:**
Lecture:
Motion in one dimension, displacement, velocity, acceleration, motion diagrams.
Freely falling objects.

3**rd week:**
Lecture:
Vectors and their properties. Components of vectors. Displacement, velocity and acceleration in two dimensions.
Motion in two dimensions. Projectile motion.

4**th week:**
Lecture:
The laws of motion. Newton's First, Second and Third Law.
Applications of Newton's Laws. Forces of friction.

5**th week:**
Lecture:
Energy. Work. Kinetic energy and the work-energy theorem. Gravitational potential energy. Spring potential energy. System and energy conservation. Power. Work done by varying forces.

6**th week:**
Lecture:
Momentum and impulse. Conservation of momentum. Collisions. Elastic and inelastic collisions.
Angular speed and angular acceleration. Rotational motion under constant angular acceleration.

7**th week:**
Lecture:
Centripetal acceleration. Newtonian gravitation. Kepler's laws.
Torque and the two conditions for equilibrium. The center of gravity.

8**th week:**

Lecture:
Rotational kinetic energy. Angular momentum. States of matter. Deformation of solids. The Youngs's, shear and bulk modulus. Density and pressure. Variation of pressure with depth. Pressure measurements.

9th **week:**
Lecture:
Buoyant forces and Archimedes's principle. Fluids in motion.
HP equation, Circulation, blood pressure measurement, transport phenomena, diffusion, osmosis, calculations with cont. eq + HP eq.

10th **week:**
Lecture:
Temperature and the zeroth law of thermodynamics. Thermometers and temperature scales. Thermal expansion of solids and fluids. Macroscopic description of an ideal gas. The kinetic theory of gases.
Energy in thermal processes. Heat and internal energy.

11th **week:**
Lecture:
Specific heat. Calorimetry. Latent heat and phase change.
The first law of thermodynamics. The second law of thermodynamics. Entropy. Refrigerators and heat pumps.

12th **week:**
Lecture:
Elastic potential energy. Hook's law. Simple harmonic motion. Motion of a pendulum.
Waves. Frequency, amplitude and wavelength. Interference of waves. Reflection of waves

13th **week:**
Lecture:
Sound. Energy and intensity of sound waves. Doppler effect
Ultrasound. Shock waves, standing waves. The ear and the principles of hearing.

14th **week:**
Lecture:
Interactive seminar and preparation for the ESE.

Contact person: Dr. Ferenc Papp, Assistant Professor, Department of Biophysics
Recommended book: Serway-Vuille: College Physics, Brooks/Cole

Subject: **INTRODUCTION TO MEDICAL CHEMISTRY I.**
Year, Semester: Basic Medicine Course, 1st
Number of teaching hours:
Lecture: **56**
Seminar: **28**

1st **week:**
Lecture:
Introduction to Chemistry. Symbols of the elements. Physical and chemical properties
The SI system of measurement

2nd **week:**
Lecture:
The atomic theory. Structure of the atom, nuclear arithmetic
Mixtures and chemical compounds. Chemical formulas. Naming chemical compounds.

3rd **week:**
Lecture:
Atomic, molecular and molar mass relationships. Percent composition and empirical/molecular formulas. Chemical equations, stoichiometry

4th **week:**
Lecture:
Summary of general chemistry 1
Test #1

5th **week:**
Lecture:
The electromagnetic spectrum. Atomic spectra. The Bohr model of hydrogen atom. The quantum mechanical model of the atom.
Electron configurations and the periodic table. Classification of the elements

6th **week:**
Lecture:
Periodic properties
Chemical bonds: metallic, ionic, and covalent bond. Electron-dot structures

7th **week:**
Lecture:
VSEPR and valence bond theory
Intermolecular forces

8th **week:**
Lecture:
Summary of general chemistry 2
Test #2

9th **week:**
Lecture:
The gaseous state
Liquid and solid state, phase changes. The chemistry of water

10th **week:**
Lecture:
Solutions. Electrolytes and nonelectrolytes
Chemical equilibrium

11th **week:**
Lecture:
Summary of general chemistry 3
Test #3

12th **week:**
Lecture:
Acids and bases 1
Acids and bases 2

13th **week:**
Lecture:
Thermochemistry: internal energy and state functions. Enthalpy. Hess's law
Redox reactions. Activity series of the elements. Galvanic cells

14th **week:**
Lecture:
Summary of general chemistry 4
Test #4

Subject: **INTRODUCTION TO BIOPHYSICS II.**
Year, Semester: Basic Medicine Course, 2nd
Number of teaching hours:
Lecture: **56**
Seminar: **28**

1st **week:**
Lecture: 1-4. Properties of electric charges. Insulators and conductors. Coulomb's law. Electric field. Electric field lines. Electric flux and Gauss's law.
Seminar: Material related to lectures 1-4.

2nd **week:**
Lecture: 5-8. Electrical energy and capacitance. The parallel plate capacitor. Combinations of capacitors. Energy stored in capacitors. Capacitors with dielectric.

Seminar: Material related to lectures 1-8.

3rd **week:**
Lecture: 9-12. Electric current. Current and voltage measurements in circuits. Resistance and Ohm's law. Resistivity, temperature variation of resistance. Semiconductors and superconductors. Electrical activity of the heart. Defibrillators.

Seminar: Material related to lectures 5-12.

4th **week:**
Lecture: 13-16. Direct current circuits. Resisorts in parallel and series. Kirchhoff's rules and complex DC circuits. RC circuits. Conduction of electrical signals by neurons.

Seminar: Material related to lectures 9-16.

5th **week:**
Lecture: 17-20. Magnetism. Megnetic field. Earth's magnetic field. Magnetic force on current carrying conductors. Toque on current loop and electric motors. Magnetic field of a long straight wire and Ampere's law. Magnetic field between two parallel conductors. Magnetic field of loops and solenoids.
Seminar: Material related to lectures 13-16.

6th **week:**
Lecture: 21-24. Induced emf and magnetic flux. Faraday's law of induction. Motional emf. Lenz's law. Generators. Self-inductance RL circuits.

Seminar: Material related to lectures 17-20.

7th **week:**
Lecture: 25-28. Alternating current. Resistors, capacitors and inductors in AC circuits. The transformer. Properties of electromagnetic waves. The spectrum of electromagnetic waves.

Seminar: Material related to lectures 21-24.

8th **week:**
Lecture: 29-32. The nature of light. Reflection, refraction and dispersion. Prisms. The rainbow. Huygen's principle. Total internal reflection and its medical applications.

Seminar: Material related to lectures 25-28.

9th **week:**
Lecture: 33-36. Lenses and mirrors. Flat mirrors. Images formed by spherical mirrors. Thin lenses. Images formed by lenses. Lens aberrations.

Seminar: Material related to lectures 29-32.

10th **week:**
Lecture: 37-40. Wave optics. Conditions for interference, polarization of light. Diffraction. The camera, the simple magnifier, the compound microscope, the telescpoe and the eye.

Seminar: Material related to lectures 33-36.

11th **week:**
Lecture: 41-44. Quantum physics. Blackbody radiation. Photoelectric effect. Particle theory of light. The production and attenuation of X-ray. Characteristic X-ray.

Seminar: Material related to lectures 37-40.

12th **week:**
Lecture: 45-48. Atomic physics. Early model of the atom. Quantum mechanics and the hydrogen atom. The spin magnetic quantum numbers. Lasers and holography.

Seminar: Material related to lectures 41-48.

13th **week:**
Lecture: 49-52. Some properties of the nuclei. Binding energy. Radioactivity, the decay processes. Medical appliacation of radioactivity. Nuclear reactions. Nuclear fission and fusion.

Positron and other antiparticles.

Seminar: Material related to lectures 49-52.

14th **week:**
Lecture: Preparation for the final exam.

Subject: **INTRODUCTION TO MEDICAL CHEMISTRY II.**
Year, Semester: Basic Medicine Course, 2nd
Number of teaching hours:
Lecture: **56**
Seminar: **28**

1st **week:**
Lecture:
The main-group elements. s-, p-, d-block metals
Nonmetals: hydrogen, halogens and noble gases

2nd **week:**
Lecture:
Nonmetals: oxygen and sulfur
Nonmetals: nitrogen, phosphorus and carbon

3rd **week:**
Lecture:
Test #5
Covalent bonding in organic compounds.
Classification of organic compounds

4th **week:**
Lecture:
Alkanes. Nomenclature and isomerism of alkanes
Reactions of alkanes. Cycloalkanes

5th **week:**
Lecture:
Unsaturated hydrocarbons
Aromatic compound: structure and properties

6th **week:**
Lecture:
Heteroaromatic compounds. Reactions of benzene and its derivatives
Organic halogen compounds

7th **week:**
Lecture:
Summary of organic chemistry 1
Test #6

8th **week:**
Lecture:
Alcohols and phenols
Ethers, thioethers.

9th **week:**
Lecture:
Organic sulfur compounds
Aldehydes, ketones and quinones

10th **week:**
Lecture:
Nitrogen containing organic compounds: aliphatic amines
Nitrogen containing organic compounds: heterocyclic nitrogen compounds. Amines of biological importance

11th **week:**
Lecture:
Summary of organic chemistry 2
Test #7

12th **week:**
Lecture:
Carboxylic acids
Substituted carboxylic acids. Carboxylic acid derivatives: esters and amides

13th **week:**
Lecture:
Carboxylic acid derivatives: halides and anhydrides; salts and detergents
Stereochemistry

14th **week:**
Lecture:
Summary of organic chemistry 3
Test #8

Contact person: Dr. Endre Kókai, Department of Medical Chemistry
Recommended books: McMurry, Fay: Chemistry (7th edition)
Erdődi, Csortos: Organic chemistry for premedical students (2010)

Subject: **HUNGARIAN LANGUAGE FOR BMC STUDENTS**
Year, Semester: Basic Medicine Course 2nd
Number of teaching hours:
Practical: **36**

1st **week:**
Practical: 1. lecke, 2. lecke I. rész

2nd **week:**
Practical: 2. lecke II. rész

3rd **week:**
Practical: 3. lecke

4th **week:**
Practical: 4. lecke, 5. lecke I. rész

5th **week:**
Practical: 5. lecke II. rész, 6. lecke I. rész

6th **week:**
Practical: 6. lecke II. rész, 7. lecke (Összefoglaló) + midterm test
Self Control Test

7th **week:**
Practical: 8. lecke

8th **week:**
Practical: 9. lecke

9th **week:**
Practical: 10. lecke

10th **week:**
Practical: 11. lecke, 12. lecke

11th **week:**
Practical: 13. lecke

12th **week:**
Practical: 14. lecke (Összefoglalás) + end term test
Oral exam

Reading materials:
Gerő Ildikó-Kovács Judit: Színesen magyarul.
2017.

CHAPTER 11
ACADEMIC PROGRAM FOR THE SHORT BASIC MEDICINE COURSE

Intensive Basic Medicine Course (Intensive BMC, Premedical Studies)
Duration of studies: 1 semester

The six-month intensive premedical Basic Medicine Course is recommended to those students who do not have thorough knowledge in Biology, Physics and Chemistry from high school. The requirements of these condensed premedical science subjects are very rigorous, thus preparation prior to the beginning the General Medicine, Dentistry or Pharmacy Program is recommended. Students successfully completing the course are directly admitted to their chosen program. The Intensive Basic Medicine Course starts in January.

Class Behavior

Students should not use cell phones to talk or text during class. Cell phones must be switched off or kept in silence mode during class. In seminars, students will be expected to participate in seminar discussions. Students are encouraged to ask questions related to the topic of the lectures discussed, and participate in solving problems related to the topic of the seminar. Some professors will ask for students to volunteer information, but some professors call on students randomly. It is, thus, a good idea to come to class prepared so as not to be embarrassed in front of the class. Students should not disrupt the class by talking to each other. If one continues to disrupt the class, the student may be asked to leave. The usage of electronic devices, textbooks and any form of interaction between students during the tests is strictly forbidden. Electronic devices (cell phones, tablets, dictionaries, etc.), except for approved simple calculators, must not be within the reach (in pocket, in the desk, etc.) of students during tests. It is the students' responsibility to stow these items before the test begins without specific warning by the supervising teachers. Violation of these above mentioned regulations results in an immediate and unconditional dismissal from the program.

Requirements

The course consists of lectures and seminars. Attending lectures is strongly recommended, attendance of seminars is compulsory and recorded. Everyone must attend the seminars with the group designated by the Registrar's Office.

Absence can significantly affect your understanding and can have serious implications for progression in your studies. One might have a maximum of six seminar absences to have the opportunity to get exemption. Students missing 7-8 seminars cannot be exempted from the Final Examination (FE), regardless of their score reached on the Self Control Tests. Students omitting 9 or more seminars are dismissed from the course. Missed seminars cannot be made up unless one obtains prior permission to be absent.

The knowledge of the students will be tested 6 times during the entire course using a written test system by **Self Control Tests (SCT).** The course ends with a **Final Exam (FE)** from the whole material of the course and a minimum of four FE dates will be set during the summer examination period. Unsuccessful students may repeat the FE twice (B and C chances, and the latter ends up with an oral examination part). Exam exemption and bonus point policy are used to improve the students' performance on SCTs. Exact details of these policies will be described below.

Exemption from FE is offered for students who achieve excellent academic performance during their studies under the following circumstances:
-the average score of the five best SCTs (out of 6) is at least 70%, AND
-passed all the SCTs with at least 30%, AND
-(s)he has a maximum of 6 seminar absences for a given subject.

Bonus points will be added to the FE score of eligible students and calculated as follows:

The average of the best 6 SCTs	Bonus points (%)

45.00-49.99	2
50.00-54.99	4
55.00-59.99	6
60.00-64.99	8
65.00-69.99	10

Students who could not meet the above described conditions for exemption must sit for the FE from the whole material of the course.
The participation shall be preceded by ID confirmation (i.e. student's card, passport or driving license) before all forms of tests. Self Control Tests, End of Semester Exams, and Final Exams will be assessed as follows.

Percentage (%)	**Mark**
0 - 59.99:	fail (1)
60.00 - 70.00:	pass (2)
70.00 - 79.99:	satisfactory (3)
80.00 - 89.99:	good (4)
90.00 - 100:	excellent (5)

Course coordinator: Dr. Beáta Lontay, Department of Medical Chemistry

Subject: INTRODUCTION TO BIOLOGY
Year, Semester: Intensive Basic Medicine Course
Number of teaching hours:
Lecture: **92**
Seminar: **92**

1**st week:**
Lecture: Small molecules and the chemistry of life 1.
Small molecules and the chemistry of life 2.
Proteins, carbohydrates and lipids 1.
Proteins, carbohydrates and lipids 2.

2**nd week:**
Lecture: Proteins, carbohydrates and lipids 3.
Nucleic acids and the origin of life.
Cells: the working units of life 1.
Cells: the working units of life 2.

3**rd week:**
Lecture: Cells: the working units of life 3.
Cells: the working units of life 4.
Bacterial cell structure
Cell membranes 1.

4**th week:**
Lecture: Cell membranes 2.
Cell membranes 3.
Energy, enzymes and metabolism 1.
Energy, enzymes and metabolism 2.

5**th week:**
Lecture: Pathways that harvest chemical energy 1.
Pathways that harvest chemical energy 2.
Pathways that harvest chemical energy 3.
The cell cycle and cell division 1.

6**th week:**
Lecture: The cell cycle and cell division 2.
The cell cycle and cell division 3.
The cell cycle and cell division 4.
Inheritance, genes and chromosomes 1.

7**th week:**
Lecture: Inheritance, genes and chromosomes 2.
Inheritance, genes and chromosomes 3.
Inheritance, genes and chromosomes 4.

Inheritance, genes and chromosomes 5.

8th week:
Lecture: DNA and its role in heredity 1.
DNA and its role in heredity 2.
DNA and its role in heredity 3.
DNA and its role in heredity 4.

9th week:
Lecture: From DNA to protein: gene expression 1.
From DNA to protein: gene expression 2.
From DNA to protein: gene expression 3.
From DNA to protein: gene expression 4.

10th week:
Lecture: Gene mutation and molecular medicine 1.
Gene mutation and molecular medicine 2.
Gene mutation and molecular medicine 3.
Gene mutation and molecular medicine 4.

11th week:
Lecture: Regulation of gene expression 1.
Regulation of gene expression 2.
Regulation of gene expression 3.
Regulation of gene expression 4.

12th week:
Lecture: The cellular signaling and communication 1.
The cellular signaling and communication 2.
The mechanism of evolution 1.
The mechanism of evolution 2.

13th week:
Lecture: Tissues, organs and organ systems 1-4.

14th week:
Lecture: Homeostasis and cellular physiology.
Temperature Regulation.
Blood, a fluid tissue 1-2.

15th week:
Lecture: Circulation 1-3. Lymphatic system.

16th week:
Lecture: Self control test.
Immunology: gene expression and natural defenses 1.
Immunology: gene expression and natural defenses 2.
Nutrition, Digestion and Absorption 1.

17th week:
Lecture: Nutrition, Digestion and Absorption 2.
Energy balance, vitamins and minerals.
Respiratory system 1-2.

18th week:
Lecture: Salt and Water Balance Nitrogen Excretion 1-2.
Hormones 1-2.

19th week:
Lecture: Hormones 3-4.
Self Control Test
Neurons and Nervous system 1.

20th week:
Lecture: Neurons and Nervous system 2-5.

21st week:
Lecture: Sensory systems 1-2.
Effectors: Musculoskeletal Systems 1-2.

22nd week:
Lecture: Musculoskeletal Systems 3.
Reproduction and Development 1-2.
Reproduction and Development 3-4.

23rd week:
Lecture: Self Control Test

Academic advisors: Dr. András Penyige, Department of Medical Genetics
Dr. Norbert Szentandrássy, Department of Physiology
Recommended book: Sadava, Hills, Heller, Berenbaum: Life (10th edition)

Subject: **INTRODUCTION TO BIOPHYSICS**
Year, Semester: Intensive Basic Medicine Course
Number of teaching hours:
Lecture: 92
Seminar: 138

1st **week:**
Lecture 1-2: Introduction to modern physics. Standard of lengths, mass, time. Conversion of units. Useful mathematics. Trigonometry. Motion in one dimension, displacement, velocity, acceleration, motion diagrams.

2nd **week:**
Lecture 3-4: Freely falling objects. Vectors and their properties. Components of vectors. Displacement, velocity and acceleration in two dimensions. Motion in two dimensions. Relative velocity.

3rd **week:**
Lecture 5-6: The laws of motion. Newton's First, Second and Third Law. Application of Newton's Laws. Forces of friction.

4th **week:**
Lecture 7-8: Kinetic energy and the work-energy theorem. Gravitational potential energy. Spring potential energy. System and energy conservation. Power. Work done by varying forces.

5th **week:**
Lecture 9-10: Momentum and impulse. Conservation of momentum. Collisions. Elastic and inelastic collisions**.**

6th **week:**
Lecture 11-12: Angular speed and angular acceleration. Rotational motion under constant angular acceleration. Centripetal acceleration. Newtonian gravitation. Kepler's laws.

7th **week:**
Lecture 13-14: Torque and the two conditions for equilibrium. The center of gravity. Rotational kinetic energy. Angular momentum.

8th **week:**
Lecture 15-16: States of matter. Deformation of solids. The Youngs's, shear and bulk modulus. Density and pressure. Variation of pressure with depth. Pressure measurements. Buoyant forces and Archimedes's principle.

9th **week:**
Lecture 17-18: Temperature and the zeroth law of thermodynamics. Thermometers and temperature scales. Thermal expansion of solids and fluids. Macroscopic description of an ideal gas. The kinetic theory of gases.

10th **week:**
Lecture 19-20: Energy in thermal processes. Heat and internal energy. Specific heat. Calorimetry. Latent heat and phase change. The first law of thermodynamics.

11th **week:**
Lecture 21-22: The second law of thermodynamics. Entropy. Refrigerators and heat pumps. Elastic potential energy. Hook's law. Simple harmonic motion. Motion of a pendulum.

12th **week:**
Lecture 23-24: Waves. Frequency, amplitude and wavelength. Interference of waves. Reflection of waves. Sound. Energy and intensity of sound waves. Shock waves, standing waves, standing waves. Doppler effect. The ear and the principles of hearing.

13th **week:**
Lecture 26-27: Properties of electric charges.

Insulators and conductors. Coulomb's law. Electric field. Electric field lines. Electric flux and Gauss's law.

14th **week:**
Lecture 28-29: Electrical energy and capacitance. The parallel plate capacitor. Combinations of capacitors. Energy stored in capacitors. Capacitors with dielectric.

15th **week:**
Lecture 30-31: Electric current. Current and voltage measurements in circuits. Resistance and Ohm's law. Resistivity, temperature variation of resistance. Semiconductors and superconductors. Electrical activity of the heart. Defibrillators.

16th **week:**
Lecture 32-33: Direct current circuits. Resistors in parallel and series. Kirchhoff's rules and complex DC circuits. RC circuits. Conduction of electrical signals by neurons.

17th **week:**
Lecture 34-35: Magnetism. Magnetic field. Earth's magnetic field. Magnetic force on current carrying conductors. Torque on a current loop and electric motors. Magnetic field of a long straight wire and Ampere's law. Magnetic field between two parallel conductors. Magnetic field of loops and solenoids.

18th **week:**
Lecture 36-37: Induced emf and magnetic flux. Faraday's law of induction. Motional emf. Lenz's law. Generators. Self-inductance RL circuits.

19th week:
Lecture 38-39: Alternating current. Resistors, capacitors and inductors in AC circuits. The transformer. Properties of electromagnetic waves. The spectrum of electromagnetic waves.

20th **week:**
Lecture 40-41: The nature of light. Reflection, refraction and dispersion. Prisms. The rainbow. Huygen's principle. Total internal reflection and its medical applications.

21st **week:**
Lecture 42-43: Lenses and mirrors. Flat mirrors. Images formed by spherical mirrors. Thin lenses. Images formed by lenses. Lens aberrations. Wave optics. Conditions for interference, polarization of light. Diffraction. The camera, the simple magnifier, the compound microscope, the telescope and the eye.

23rd **week 44-45:** Quantum physics. Blackbody radiation, photoelectric effect, generation of X-ray.
Some properties of the nuclei. Binding energy. Radioactivity, the decay processes. Medical application of radioactivity.

Academic advisor: Dr. Attila Jenei, Department of Biophysics and Cell Biology
Recommended book: Serway, Vuille: College Physics (11th edition)

Subject: **INTRODUCTION TO MEDICAL CHEMISTRY I-II.**
Year, Semester: Intensive Basic Medicine Course
Number of teaching hours:
Lecture: 92
Seminar: 92

1st **week:**
Lecture:
Introduction to Chemistry. Symbols of the elements. Physical and chemical properties
The SI system of measurement

2nd **week:**
Lecture:
The atomic theory. Structure of the atom, nuclear arithmetic
Mixtures and chemical compounds. Chemical formulas. Naming chemical compounds

3rd **week:**
Lecture:

Atomic, molecular and molar mass relationships
Percent composition and empirical/molecular formulas. Chemical equations, stoichiometry

4th week:
Lecture:
Summary of general chemistry 1
Test #1

5th week:
Lecture:
The electromagnetic spectrum. Atomic spectra. The Bohr model of hydrogen atom. The quantum mechanical model of the atom.
Electron configurations and the periodic table. Classification of the elements

6th week:
Lecture:
Periodic properties
Chemical bonds: metallic, ionic, and covalent bond. Electron-dot structures

7th week:
Lecture:
VSEPR and valence bond theory
Intermolecular forces

8th week:
Lecture:
The gaseous state
Liquid and solid state, phase changes. The chemistry of water

9th week:
Lecture:
Solutions. Electrolytes and nonelectrolytes
Summary of general chemistry 2
Test #2

10th week:
Lecture:
Chemical equilibrium
Acids and bases 1

11th week:
Lecture:
Acids and bases 2
Thermochemistry: internal energy and state functions. Enthalpy. Hess's law

12th week:
Lecture:
Redox reactions. Activity series of the elements. Galvanic cells
Summary of general chemistry 3
Test #3

13th week:
Lecture:
The main-group elements. s-, p-, d-block metals
Nonmetals: hydrogen, halogens and noble gases

14th week:
Lecture:
Nonmetals: oxygen and sulfur
Nonmetals: nitrogen, phosphorus and carbon

15th week:
Lecture:
Covalent bonding in organic compounds.
Classification of organic compounds.
Alkanes. Nomenclature and isomerism of alkanes
Reactions of alkanes. Cycloalkanes

16th week:
Lecture:
Unsaturated hydrocarbons
Summary of organic chemistry 1
Test #4

17th week:
Lecture:
Aromatic compounds: structure and properties
Heteroaromatic compounds. Reactions of benzene and its derivatives

18th week:
Lecture:
Organic halogen compounds
Alcohols and phenols

19th week:
Lecture:
Ethers, thioethers. Organic sulfur compounds
Aldehydes, ketones and quinones

20th week:
Lecture:
Summary of organic chemistry 2
Test #5
Nitrogen containing organic compounds 1: aliphatic amines

21st week:

Lecture:
Nitrogen containing organic compounds 2: heterocyclic nitrogen compounds. Amines of biological importance
Carboxylic acids

22nd **week:**
Lecture:
Substituted carboxylic acids. Carboxylic acid derivatives 1: esters and amides
Carboxylic acid derivatives 2: halides and anhydrides; salts and detergents

23rd **week:**
Lecture:
Stereochemistry
Summary of organic chemistry 3
Test #6

Contact person: Dr. Krisztina Tar, Department of Medical Chemistry
Recommended books:
McMurry, Fay: Chemsitry (7th edition)
Erdődi, Csortos: Organic chemistry for premedical students (2010)