The University of Pécs
Medical School

DENTISTRY
Major

STUDY PROGRAM
2010/2011

Subjects of the
Basic module
(obligatory subjects)

Table of contents

OSABI1 BIOPHYSICS 1

Course director: **DR. GÁBOR HILD**, associate professor
Department of Biophysics

4 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 1

Number of hours/semester: **28 lectures + 28 practices + 0 seminars = total of 56 hours**

Headcount limitations (min-max.): **5 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

The course addresses the physical basis of the structure and function of biological systems. The main topics include atomic and nuclear physics, thermodynamics, transport processes, molecular and supramolecular systems, bioelectric phenomena, and biological motion.

Conditions for acceptance of the semester

Completion and proper documentation of each laboratory practice and approval thereof by the course instructor. Maximum 3 absences from practices. Students are not allowed to be late from the practicals. Being late counts as an absence.

Making up for missed classes

Missed practices can be made up during make-up opportunities provided by the department. During each make-up lab, only one missed practice can be executed.

Reading material

1. Medical Biophysics (ed. Damjanovich Sándor, Fidy Judit, Szöllősi János). Medicina, Budapest, 2008
2. Biophysics Laboratory Manual, Pécs University Press, Pécs
3. Online materials on departmental website (http://biofizika.aok.pte.hu)

Lectures

1. Molecular basis of muscle function and contraction regulation
2. Structure and mechanics of striated muscle
3. Motor proteins. Cell motility
4. The cytoskeletal system
5. Vision
6. Hearing
7. Sensory receptors
8. The cell membrane. Resting potential, action potential
9. Protein structure and folding
10. Structure and dynamics of macromolecules
11. Biophysics of water
12. Biophysics of circulation. Cardiac biophysics
13. Fluid flow
14. Osmosis
15. Diffusion
16. Thermodynamic potentials
17. Laws of thermodynamics
18. Foundations of thermodynamics
19. Biological effects of radioactive radiation
20. Interaction of radioactive radiation with matter
21. X-rays
22. Structure of the atomic nucleus. Radioativity
23. Electromagnetic spectrum. Light
24. Quantum numbers
25. Structure of the atom
26. Foundations of quantum physics
27. Introduction to Biophysics
28. Structure of the atomic nucleus. Radioactivity

Practices

1. Direct Current measurements
2. Alternating Current measurements
3. Electrical conductance
4. Refractometry
5. Spectroscopy and spectrophotometry
6. Polarimetry

7. Viscosity of fluids
8. Surface tension
9. Adsorption and swelling
10. Centrifugation
11. Electrophoresis

Seminars

Exam topics/questions

Can be found on the departmental website: http://biofizika.aok.pte.hu

OSAMB1 MOLECULAR CELL BIOLOGY 1

Course director: **DR. JÓZSEF SZEBERÉNYI**, professor
Department of Medical Biology

6 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 1

Number of hours/semester: **42 lectures + 12 practices + 30 seminars = total of 84 hours**

Headcount limitations (min-max.): **1 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

To provide molecular and cellular biological basis for the teaching of anatomy, biochemistry, physiology, pathology, pathophysiology, microbiology and pharmacology. To teach students molecular cell biology facts essential for clinical subjects. The course covers cellular and molecular characteristics of the structure and functions of the cell. Main topics: functional morphology of eukaryotic cells; mechanisms of the storage, replication and expression of genetic information.

The detailed list of topics will be available on the first seminar for each group.

Conditions for acceptance of the semester

According to the code of studies.

Making up for missed classes

Extra lab programs at the end of each practical cycle

Reading material

Cooper, G.M.: The Cell. A Molecular Approach

Szeberényi, J., Komáromy, L. (editors): Molecular Cell Biology Laboratory Manual

Szeberényi, J., Komáromy, L.: Molecular Cell Biology Syllabus

Lectures

1. Educational objectives
2. Comparison of prokaryotic and eukaryotic cells
3. Modern morphological techniques I.
4. Modern morphological techniques II.
5. Methods of molecular biology I.
6. Methods of molecular biology II.
7. Methods of molecular biology III.
8. Methods of molecular biology IV.
9. Methods of molecular biology V.
10. The cell nucleus
11. Genome organisation
12. The chemical composition of chromatin
13. The cell cycle I.
14. The cell cycle II.
15. DNA replication I.
16. DNA replication II.
17. DNA repair
18. Transcription in prokaryotes
19. The synthesis of rRNA in eukaryotes
20. The synthesis of hnRNA in eukaryotes
21. hnRNA processing
22. The pathology of cell nucleus
23. Closing lecture
24. Cytoplasmic organelles: An overview
25. Translation I.
26. Translation II.
27. Translation III.
28. Regulation of gene expression in prokaryotes
29. Regulation of gene expression in eukaryotes I.
30. Regulation of gene expression in eukaryotes II.
31. Rough endoplasmic reticulum
32. Golgi complex. Protein glycosylation and sorting
33. Endocytosis. Vesicular transport
34. Cell defence mechanisms I.: lysosomes, smooth ER
35. Cell defence mechanisms II.: oxygen free radicals, membrane damage

36. Mitochondria I.
37. Mitochondria II.
38. Cytoskeleton I.
39. Cytoskeleton II.
40. The cell membrane
41. Passive transport processes
42. Closing lecture

Practices

1. Light microscopy
2. Light microscopy
3. Separation methods (Centrifugation, chromatography)
4. Separation methods (Centrifugation, chromatography)
5. Separation methods (electrophoresis)
6. Separation methods (electrophoresis)
7. solation of DNA and RNA
8. Isolation of DNA and RNA
9. Plasmid isolation
10. Plasmid isolation
11. Restriction mapping
12. Restriction mapping

Seminars

1. General information. Preview of lab cycle I.
2. Biological macromolecules.
3. Light microscopy
4. Comparison of pro- and eukaryotic cells
5. Separation methods.
6. Methods of molecular biology I.
7. Methods of molecular biology II.
8. TEST: Biological macromolecules. Light microscopy. Pro- and eukaryotic cells. Separation techniques.
9. Methods of molecular biology III.
10. Cell nucleus.
11. Genome organisation. Chromatin
12. The cell cycle. DNA replication
13. Electron microscopy (demonstration)
14. Electron microscopy (demonstration)
15. TEST: Methods of molecular biology. The cell nucleus. Genome organisation. Chromatin. Cell cycle. Replication
16. DNA repair. Mitosis. Preview of lab cycle II.
17. Transcription
18. RNA processing.
19. The pathology of cell nucleus
20. SEMESTER TEST
21. SEMESTER TEST
22. SEMESTER TEST
23. Mitochondria II.
24. Mitochondria I.
25. Cell defence mechanisms
26. Rough ER. Golgi complex. Vesicular transport
27. Gene regulation II.
28. Gene regulation I.
29. Translation.
30. TEST: DNA repair. Mitosis. Electron microscopy. Transcription. RNA processing. The pathology of cell nucleus

Exam topics/questions

1. Proteins
2. Lipids
3. Carbohydrates
4. Nucleosides, nucleotides
5. Comparison of pro- and eukaryotic cells
6. Methods of immunocytochemistry

7. Restriction endonucleases
8. Southern blotting
9. DNA sequencing
10. DNA chips
11. Genomic libraries
12. Polymerase chain reaction
13. Transgenic organisms
14. Targeted inhibition of endogenous gene function
15. cDNA libraries
16. Northern blotting
17. Immunoprecipitation and Western blotting
18. The structure of cell nucleus
19. The organisation of chromatin
20. The structure of DNA
21. DNA, the genetic material
22. Unique and repetitive sequences
23. The chemical composition of chromatin
24. The phases of cell cycle
25. The regulation of cell cycle
26. Mitosis
27. General features of replication
28. The mechanism of replication in prokaryotes
29. Eukaryotic replication
30. DNA repair
31. The mechanism of prokaryotic transcription
32. General features of eukaryotic transcription
33. Synthesis and processing of eukaryotic pre-rRNA
34. Synthesis of pre-mRNA in eukaryotes. Cap-formation and polyadenylation.
35. Pre-mRNA splicing
36. The structure and classes of RNA
37. Synthesis of aminoacyl-tRNA
38. The structure and function of ribosomes
39. The genetic code
40. Initiation of translation
41. Elongation and termination of translation
42. General features of translation
43. The lactose operon
44. The tryptophan operon
45. Levels of regulation of eukaryotic gene expression
46. Eukaryotic transcription factors
47. The mechanism of action of steroid hormones
48. Rough endoplasmic reticulum
49. Golgi complex. Protein glycosylation
50. The mechanism of secretion
51. Endocytosis
52. The mechanism of vesicular transport
53. Lysosomes. Smooth endoplasmic reticulum
54. Oxygen free radicals. Membrane damage. Lipid peroxidation
55. The structure and function of mitochondria
56. The genetic apparatus of mitochondria
57. Mitochondrial diseases

OSAOM1 MEDICAL CHEMISTRY 1

Course director: **DR. TAMÁS LÓRÁND**, associate professor
Department of Biochemistry and Medical Chemistry

6 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 1

Number of hours/semester: **42 lectures + 28 practices + 14 seminars = total of 84 hours**

Headcount limitations (min-max.): **0 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

Medical chemistry includes the topics of general chemistry which are necessary for the medical students. It deals with the chemistry of organic functional groups in a concise way. Majority of the curriculum deals with the bioorganic chemistry, which means the chemistry and descriptive biochemistry of biomolecules. Purpose of practices to study some analytical chemistry and knowledge of materials. Curriculum of medical chemistry contains the basic knowledge that is necessary to understand biochemistry, pharmacology and clinical chemistry.

Conditions for acceptance of the semester

Completing two Test Papers reaching minimum 30% as an average.

As regards the lab questions written weekly at the beginning of the practice, students have to write minimum 10 of them and they have to give minimum seven correct answers.

It is obligatory to attend lectures, seminars and practices. Maximum absences: 12 hours altogether.

The students are obliged to attend the General Chemistry course. If they fulfilled the requirements of this course, they can sit for an exam of Medical Chemistry.

Making up for missed classes

None.

Reading material

McMurray, Fay: Chemistry (latest edition)

Darrell D. Ebbing (Ed.): General Chemistry(latest edition)

Veronika Nagy (Ed.):Laboratory experiments in medical chemistry (Univ. Med. School of Pécs, 2010)Internet edition.

P. Gergely (Ed.): Organic and bioorganic chemistry for medical students (Univ. Med. School of Debrecen, latest edition)

P. Gergely (Ed.):Introduction to Bioinorganic chemistry for medical students (Univ. Med. School of Debrecen,latest edition)

A. Zeeck: Chemie für Mediziener (latest edition)

Lectures

1. Introduction to Medical Chemistry, connection with medicine.
2. The periodic table. Chemical bonding.
3. Basics of valence bond and molecular orbital theories. Secondary interactions.
4. Basics in inorganic chemistry. I
5. Basics in inorganic chemistry. II
6. Basics in inorganic chemistry. III
7. States of matter, gas laws. Water and aqueous solutions. Dissolution of gases, liquids and solids.
8. Colligative properties of dilute solutions.
9. Chemical equilibrium, mass action law. Heterogeneous equilibria. Solubility product.
10. Acid-base theories. Derivatives of acids, salts, thiocompounds.
11. Electrolytic dissociation. Activity and ionic strength. Classification of electrolytes, degree of dissociation, conductivity.
12. Ion product constant of water, pH, pOH. Acid-base indicators.
13. Hydrolysis of salts.
14. Buffer solutions, physiological buffer systems.
15. Chemical kinetics.
16. Complexes: structure, nomenclature, stability. I
17. Complexes: structure, nomenclature, stability. II
18. Colloids.
19. Thermodynamics, thermochemistry. I
20. Thermodynamics, thermochemistry. II
21. Photochemistry.
22. Electrochemistry. I
23. Electrochemistry. II
24. Introduction to organic chemistry. Structure of carbon compounds, hybridisation of carbon.
25. Stereoelectronic effects. Functional groups, families of organic compounds.
26. Reaction types in organic chemistry.
27. Basics of stereochemisty, types of isomerism.
28. Alkanes, cycloalkanes and conformational isomerism.

29. Alkenes and geometrical isomerism.
30. Alkynes.
31. Aromatic hydrocarbons.
32. Organic halides.
33. Optical isomerism and configuration.
34. Alcohols, phenols. I
35. Alcohols, phenols. II
36. Ethers.
37. Organic thio-compounds.
38. Oxocompounds: aldehydes, ketones, quinones. I
39. Oxocompounds: aldehydes, ketones, quinones. II
40. Carboxylic acids and their derivatives. I
41. Carboxylic acids and their derivatives. II
42. Carboxylic acids and their derivatives. III

Practices

1. Laboratory regulations. Accident and fire protection
2. Demonstration: filtration and separatory funnel.
3. Physical changes, phase transfers. I
4. Physical changes, phase transfers. II
5. Experiments on biologically important non-metals I. (halogenes, oxygen, sulphur)
6. Experiments on biologically important non-metals I (halogenes, oxygen, sulphur)
7. Experiments on biologically important non-metals II (sulphur, nitrogen-group)
8. Experiments on biologically important non-metals II (sulphur, nitrogen-group)
9. Experiments on biologically important non-metals III. (carbon-group)
10. Experiments on biologically important non-metals III. (carbon-group)
11. Experiments on biologically important metals I. (s-block, aluminium)
12. Experiments on biologically important metals I. (s-block, aluminium)
13. Experiments on biologically important metals II. (d-block elements). Dilute solutions. Colloids.
14. Experiments on biologically important metals II. (d-block elements). Dilute solutions. Colloids.
15. Experiments on kinetics and equilibria. Thermochemistry. I
16. Experiments on kinetics and equilibria. Thermochemistry. II
17. Electrochemisty. I
18. Electrochemisty. II
19. Titrations of hydrochloric acid and lactic acid. I
20. Titrations of hydrochloric acid and lactic acid. II
21. Preparation of solutions.
22. Potenciometric titration. Titrations of phosphoric acid.
23. Experiments on buffer solutions. I
24. Experiments on buffer solutions. II
25. Permanganometry. I
26. Permanganometry. II
27. -
28. -

Seminars

1. Basic concepts. Writing equations. Calculations connected to stoichiometry.
2. Oxidation number. Redox and ionic equations. I
3. Concentration of solutions I.
4. Concentration of solutions II.
5. Concentration of solutions III. Colligative properties. Demonstration: osmometry.
6. Calculations (Practice)
7. Test paper I. Landolt-experiment
8. Electrolytic equilibria, calculation of pH. I
9. Electrolytic equilibria, calculation of pH. Hydolysis of salts. I
10. Buffer solutions. I
11. Buffer solutions. II
12. Solubility product.
13. Organic chemistry. Test paper II.
14. Organic chemistry

Exam topics/questions
http://www.pote.hu/index.php?page=egyseg&egy_id=20&nyelv=eng&menu=okt_anyag

OSAPV1 PREVENTIVE DENTISTRY 1

Course director: **DR. ILDIKÓ SZÁNTÓ**, clinical specialist
Dept. of Dentistry, Oral-, Maxillofacial Surgery

3 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 1

Number of hours/semester: **14 lectures + 28 practices + 0 seminars = total of 42 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

The aim of this study is to provide a well-rounded education of first practical knowledge of dentistry, the anatomy, the materials and any information of prevention.

Conditions for acceptance of the semester

All practices, available semester test. 2 pieces of wax tooth carving.

Making up for missed classes

None.

Reading material

Lectures.

Lectures

1. Introduction to Primary Preventive Dentistry
2. Anatomy of the Masticatory System
3. Elementary Basic Behaviours in Dental Office. Basic Equipments
4. The Development and Structure of Dental Plaque, Calculus, and other Tooth-Adherent Organic Materials
5. The Role of Dental Plaque in the Etiology and Progress of Periodontal Disease
6. Toothbrushes and Toothbrushing Methods
7. Dentifrices, Mouthrinses and Chewing Gums
8. Suplementary Toothbrushing Methods
9. Calculus Removing, Scaling and Polishing
10. Etiology of Caries Lesions
11. The Role of Fluoride in Caries Prevention, Toxicologic Aspects
12. Local Fluoride Prevention
13. Systemic Fluoride Prevention
14. Demineralization, Remineralization

Practices

1. 1. Examination in the Oral Cavity
2. 1. Examination in the Oral Cavity
3. 2. Dental Equipments: Dental Mirror and Explorer
4. 2. Dental Equipments: Dental Mirror and Explorer
5. 3. Dental Waxes
6. 3. Dental Waxes
7. 4. Carving
8. 4. Carving
9. 5. Equipments of Oral-Health Self-Care
10. 5. Equipments of Oral-Health Self-Care
11. 6. Toothbrushing Methods
12. 6. Toothbrushing Methods
13. 7. Dental Floss
14. 7. Dental Floss
15. 8. Characteristics of Supragingival and Subgingival Calculus
16. 8. Characteristics of Supragingival and Subgingival Calculus
17. 9. Calculus Removing in Practice
18. 9. Calculus Removing in Practice
19. 10. Professional Dental-Hygienic Equipments
20. 10. Professional Dental-Hygienic Equipments
21. 11. Fabrication of Individual Splint
22. 11. Fabrication of Individual Splint
23. 11. Fabrication of Individual Splint
24. 11. Fabrication of Individual Splint
25. 13. Adaptation of Individual Splints

26. 13. Adaptation of Individual Splints
27. 14. Test
28. 14. Test

Seminars

Exam topics/questions
Test

OSAAT1 ANATOMY 1

Course director: **DR. PÁL TÓTH**, associate professor
Department of Anatomy

3 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 2

Number of hours/semester: **14 lectures + 28 practices + 0 seminars = total of 42 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

Anatomy-1 is to teach the macroscopic structure of the bones, joints and muscles of the human body, as well as the regional anatomy of the trunk and limbs including their functional aspects. This is the first part of a two-semester subject.

Conditions for acceptance of the semester

Presence on at least 85% of the lectures and practices. Absences (with any reason!) from no more than 6 hours (6x45 min = e.g. 3 weekly practices, or 2 practices and 2 lectures, et.)

Making up for missed classes

Exceptionally, students may attend the practice of another group (on the same week).

Reading material

http://an-server.pote.hu

Lectures

1. Review of the lower limb II; Blood and nerve supply. Frequent injuries and their consequences.
2. Review of the lower limb I.; Joints, muscles and their functions.
3. Review of the upper limb II; Blood and nerve supply. Frequent injuries and their consequences.
4. Review of the upper limb I.; Joints, muscles and their functions.
5. Clinical aspects of the trunk and lower limbs.
6. Bones and cavities of the viscerocranium.
7. Bones and structure of the skull. The neurocranium.
8. Lymphatic drainage of the limbs and breast. Clinical importance of the primary lymph nodes.
9. Structure and movements of the thorax and vertebral column.
10. Clinical aspects of the pelvis and lower limb. Imaging techniques.
11. General myology, angiology and neurology. Introduction to the Regional Anatomy.
12. The pelvis and the foot. Structures and functions.
13. General osteology and arthrology.
14. Introduction to the Anatomy.

Practices

1. The hip joint. The bones and joints of the lower limb.
2. The skull.
3. Topographic anatomy of the ventral aspect of the upper and lower limbs (demonstration). The structure and regions of the abdominal wall (demonstration).
4. Topographic anatomy of the ventral aspect of the upper and lower limbs (demonstration). The structure and regions of the abdominal wall (demonstration).
5. Topographic anatomy of the ventral aspect of the upper and lower limbs (demonstration). The structure and regions of the abdominal wall (demonstration).
6. Topographic anatomy of the ventral aspect of the upper and lower limbs (demonstration). The structure and regions of the abdominal wall (demonstration).
7. Joints of the shoulder girdle. The elbow joint. Joints of the hand.
8. Joints of the shoulder girdle. The elbow joint. Joints of the hand.
9. The hip bone and the sacrum. The lesser pelvis.
10. The hip bone and the sacrum. The lesser pelvis.
11. The hip joint. The bones and joints of the lower limb.
12. The skull.
13. Topographic anatomy of the ventral aspect of the upper and lower limbs (demonstration). The structure and regions of the abdominal wall (demonstration).
14. Topographic anatomy of the ventral aspect of the upper and lower limbs (demonstration). The structure and regions of the abdominal wall (demonstration).
15. Topographic anatomy of the dorsal aspects of the upper and lower limbs (demonstration). The skull.
16. Topographic anatomy of the dorsal aspects of the upper and lower limbs (demonstration). The skull.
17. Topographic anatomy of the dorsal aspect of the upper and lower limbs (demonstration). R nuchae, muscles of the back (demonstration).

18. Topographic anatomy of the dorsal aspect of the upper and lower limbs (demonstration). R nuchae, muscles of the back (demonstration).
19. Topographic anatomy of the dorsal aspect of the upper and lower limbs (demonstration). R nuchae, muscles of the back (demonstration).
20. Topographic anatomy of the dorsal aspect of the upper and lower limbs (demonstration). R nuchae, muscles of the back (demonstration).
21. Dorsal and ventral regions of the limbs (demonstration).
22. Dorsal and ventral regions of the limbs(demonstration).
23. The skull.
24. The skull.
25. Vertebrae, ribs and thorax.
26. Vertebrae, ribs and thorax.
27. The main plains and directions. Bones of the shoulder girdle, the arm, the forearm and the hand.
28. The main plains and directions. Bones of the shoulder girdle, the arm, the forearm and the hand.

Seminars

Exam topics/questions

http://an-server.pote.hu

OSABI2 BIOPHYSICS 2

Course director: **DR. GÁBOR HILD**, associate professor
Department of Biophysics

3 credit ▪ final exam ▪ Basic module ▪ spring semester ▪ recommended semester: 2

Number of hours/semester: **14 lectures + 28 practices + 0 seminars = total of 42 hours**

Headcount limitations (min-max.): **5 – 0**

Prerequisites: **see in the recommended curricula**

Topic

The course, stemming from 'Biophysics 1' addresses the foundations of physical and biophysical methods used for exploring biological systems particularly the human body, as well as those of physical diagnostic methods. The latter are discussed briefly with references made to a respective topical pre-clinical course.

Conditions for acceptance of the semester

Completion and proper documentation of each laboratory practice and approval thereof by the course instructor. Maximum 3 absences from practices. Students are not allowed to be late from the practicals. Being late counts as an absence.

Making up for missed classes

Missed practices can be made up during make-up opportunities provided by the department. During each make-up lab, only one missed practice can be made up.

Reading material

1. Medical Biophysics (ed. Damjanovich Sándor, Fidy Judit, Szöllősi János). Medicina, Budapest, 2008
2. Biophysics Laboratory Maual, Pécs University Press, Pécs
3. Online materials on departmental website (http://biofizika.aok.pte.hu)

Lectures

1. Absorption photometry
2. Fluorescence spectroscopy
3. Fluorescence polarization. FRAP
4. FRET. Fluorescene quenching
5. X-ray diffraction
6. Transient kinetic methods
7. Modern microscopic methods
8. Sedimentation, electrophoresis
9. Infrared, Raman and CD spectroscopy
10. ESR, NMR
11. Flow cytometry
12. Ultrasound
13. CT, MRI
14. Gamma-camera, SPECT, PET

Practices

1. The Geiger-Müller counter
2. Radioactive half-life
3. Gamma-absorption and spectrometry
4. Absorption of beta-radiation, dead time
5. Scintigraphy
6. Optics
7. Absorption photometry
8. Blood pressure
9. Electrocardiography (EKG)
10. Ultrasound
11. Temperature measurement
12. Polarimetry
13. Illumination

Seminars

Exam topics/questions

Can be found on the departmental website (http://biofizika.aok.pte.hu)

OSAMB2 MOLECULAR CELL BIOLOGY 2

Course director: **DR. JÓZSEF SZEBERÉNYI**, professor
Department of Medical Biology

4 credit ▪ final exam ▪ Basic module ▪ spring semester ▪ recommended semester: 2

Number of hours/semester: **28 lectures + 12 practices + 16 seminars = total of 56 hours**

Headcount limitations (min-max.): **1 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

To provide molecular and cellular biological basis for the teaching of anatomy, biochemistry, physiology, pathology, pathophysiology, microbiology and pharmacology. To teach students molecular cell biology facts essential for clinical subjects. Main topics: cell membrane and extracellular matrix; intracellular signal transduction; cellular and molecular mechanisms of carcinogenesis; introduction to medical genetics; molecular medicine.

The detailed list of topics will be available on the first seminar for each group.

Conditions for acceptance of the semester

According to the code of studies.

Making up for missed classes

Extra lab programs at the end of each practical cycle.

Reading material

Cooper, G.M.: The Cell. A Molecular Approach.

Szeberényi, J., Komáromy, L. (editors): Molecular Cell Biology Laboratory Manual

Szeberényi, J., Komáromy, L.: Molecular Cell Biology Syllabus

Lectures

1. Opening lecture
2. Active transport processes
3. Extracellular matrix
4. Signal transduction mechanisms I.
5. Signal transduction mechanisms II.
6. Signal transduction mechanisms III.
7. Signal transduction mechanisms IV.
8. Signal transduction mechanisms V.
9. The molecular basis of development
10. Apoptosis
11. The tumour cell
12. DNA tumour viruses
13. RNA tumour viruses
14. Retroviral oncogenes
15. Cellular oncogenes I.
16. Cellular oncogenes II.
17. Cellular oncogenes III.
18. Tumour suppresser genes I.
19. Tumour suppressor genes II.
20. Oncogenes and the cell cycle
21. The multistage mechanism of carcinogenesis
22. Closing lecture
23. Cytogenetics I.
24. Cytogenetics II.
25. Types of inheritance
26. Molecular diagnostics
27. Gene therapy
28. Closing lecture

Practices

1. Histochemistry of nucleic acids
2. Histochemistry of nucleic acids
3. Phase contrast microscopy. Polarisation microscopy
4. Phase contrast microscopy. Polarisation microscopy
5. Histochemistry of the cytoplasm
6. Histochemistry of the cytoplasm

7. Permeability
8. Permeability
9. Signal transduction. The tumour cell
10. Signal transduction. The tumour cell
11. ntroduction to clinical genetics
12. Introduction to clinical genetics

Seminars

1. Cytoskeleton
2. Membrane
3. Transport. Extracellular matrix. Signal transduction mechanisms
4. Types of chemical signalling. Receptors. The cAMP pathway
5. TEST: Cytoskeleton. Membrane, transport, extracellular matrix. Chemical signalling. Receptors. The cAMP pathway
6. Signal transduction mechanisms: the phospholipase C pathway. Growth factor and cytokine signalling
7. TEST: Phospholipase C. Growth factor, stress, integrin and cytokine signalling. General features of signalling.
8. Developmental biology. Apoptosis. The tumour cell.
9. Tumour viruses
10. Retroviral oncogenes. Cellular oncogenes
11. TEST: Developmental biology. Apoptosis. Tumour cell. Tumour viruses. Retroviral and cellular oncogenes
12. SEMESTER TEST
13. Tumour suppresser genes. Oncogenes and the cell cycle (odd numbered groups)
14. The multistage mechanism of carcinogenesis. Cytogenetics.
15. Types of inheritance. Molecular medicine
16. SEMESTER TEST

Exam topics/questions

Theoretical examination questions

1. Proteins
2. Lipids
3. Carbohydrates
4. Nucleosides, nucleotides
5. Comparison of pro- and eukaryotic cells
6. Methods of immunocytochemistry
7. Restriction endonucleases
8. Southern blotting
9. DNA sequencing
10. DNA chips
11. Genomic libraries
12. Polymerase chain reaction
13. Transgenic organisms
14. Targeted inhibition of endogenous gene function
15. cDNA libraries
16. Northern blotting
17. Immunoprecipitation and Western blotting
18. The structure of cell nucleus
19. The organisation of chromatin
20. The structure of DNA
21. DNA, the genetic material
22. Unique and repetitive sequences
23. The chemical composition of chromatin
24. The phases of cell cycle
25. The regulation of cell cycle
26. Mitosis
27. General features of replication
28. The mechanism of replication in prokaryotes
29. Eukaryotic replication
30. DNA repair
31. The mechanism of prokaryotic transcription
32. General features of eukaryotic transcription
33. Synthesis and processing of eukaryotic pre-rRNA

34. Synthesis of pre-mRNA in eukaryotes. Cap formation and polyadenylation
35. Pre-mRNA splicing
36. The structure and classes of RNA
37. Synthesis of aminoacyl-tRNA
38. The structure and function of ribosomes
39. The genetic code
40. Initiation of translation
41. Elongation and termination of translation
42. General features of translation
43. The lactose operon
44. The tryptophan operon
45. Levels of regulation of eukaryotic gene expression
46. Eukaryotic transcription factors
47. The mechanism of action of steroid hormones
48. Rough endoplasmic reticulum
49. Golgi complex. Protein glycosylation
50. The mechanism of secretion
51. Endocytosis
52. The mechanism of vesicular transport
53. Lysosomes. Smooth endoplasmic reticulum
54. Oxygen free radicals. Membrane damage. Lipid peroxidation
55. The structure and function of mitochondria
56. The genetic apparatus of mitochondria
57. Mitochondrial diseases
58. Microtubules
59. Microfilaments
60. Intermediate filaments
61. The cell membrane
62. Cell junctions
63. Passive transport
64. Active transport
65. The extracellular matrix
66. Cell-matrix connections
67. Types of chemical signalling
68. cAMP-mediated signal transduction
69. Phospholipid-derived second messengers
70. Growth factor signalling
71. The role of protein kinases in cell regulation
72. Cytokine signalling. Stress signalling
73. General features of signal transduction
74. Molecular basis of development
75. The physiological and pathological role of apoptosis
76. The mechanism of apoptosis
77. General features of the tumour cell
78. Oncogenic DNA viruses
79. Retroviruses
80. Retroviral oncogenes
81. Identification of cellular oncogenes by gene transfer
82. Oncogenesis by weakly transforming retroviruses
83. Mechanisms of cellular oncogene activation
84. General features of tumour suppressor genes
85. Rb and p53 proteins
86. The role of tumour suppressor genes in Wilms tumour, neurofibromatosis, colon and breast cancer
87. The role of oncogenes in cell cycle regulation
88. The multistage mechanism of carcinogenesis
89. Meiosis
90. Autosomal chromosome abnormalities
91. Sex chromosome abnormalities
92. Autosomal inheritance of diseases

93. Sex-linked inheritance of diseases
94. Molecular diagnosis of inherited diseases
95. Molecular diagnosis of tumours and infectious diseases
96. Methods of gene transfer
97. Human gene therapy.

Laboratory examination questions

1. Structure and operation of the light microscope
2. Structure and operation of the electron microscope
3. Sample preparation and contrasting methods for light- and electron microscopy
4. Radioactive isotopes in molecular cell biology
5. Homogenisation, cell fractionation
6. Hypopicnic and isopicnic gradient centrifugation
7. Gel filtration
8. Ion exchange and affinity chromatography
9. Protein electrophoresis
10. Nucleic acid electrophoresis
11. Isolation of mammalian DNA
12. Isolation of mammalian RNA
13. Plasmids, plasmid isolation
14. Histochemistry of nucleic acids
15. Histochemistry of the cytoplasm
16. Phase-contrast microscope
17. Polarisation microscope
18. Enzyme histochemistry and immunohistochemistry
19. Plasmolysis and haemolysis
20. Methods of cytogenetics
21. Observation of prokaryotic cells by immersion objective
22. Determination of cell diameter by light microscope
23. Separation of starch and Cl- by gel filtration - analysis of the diagram
24. Operation of the photometer - determination of DNA and RNA concentration
25. Analysis of protein gels and Western blots
26. Analysis of histochemistric preparations - cytoplasm
27. Identification of nuclear components on electron microscopic pictures
28. Analysis of agarose gels after plasmid electrophoresis and restriction mapping
29. Analysis of histochemistric preparations - nucleic acids
30. Operation of the polarising microscope
31. Centring adjustment and operation of the phase-contrast microscope
32. Identification of cytoplasmic organelles on electron microscopic pictures
33. Lymph node from Burkitt lymphoma - identification of mitotic figures
34. Analysis of light microscopic autoradiographic preparation
35. Identification of normal and cancer cells on PAP-smears
36. Identification of inheritance patterns on pedigrees
37. Analysis of chromosomal abnormalities
38. Observations of immunohistochemichal preparations
39. Identification of undifferentiated, differentiated and apoptotic PC12 cells
40. Analysis of chromosome preparations

OSAOK2 MEDICAL CHEMISTRY 2

Course director: **DR. TAMÁS LÓRÁND**, associate professor
Department of Biochemistry and Medical Chemistry

4 credit ▪ final exam ▪ Basic module ▪ spring semester ▪ recommended semester: 2

Number of hours/semester: **28 lectures + 28 practices + 0 seminars = total of 56 hours**

Headcount limitations (min-max.): **1 – 250**

Prerequisites: **see in the recommended curricula!**

Topic

Medical chemistry includes the topics of general chemistry which are necessary for the medical students. It deals with the chemistry of organic functional groups in a concise way. Majority of the curriculum deals with the bioorganic chemistry, which means the chemistry and descriptive biochemistry of biomolecules. Purpose of practices to study some analytical chemistry and knowledge of materials. Curriculum of medical chemistry contains the basic knowledge that are necessary to understand biochemistry, pharmacology and clinical chemistry.

Conditions for acceptance of the semester

Completing two Test Papers reaching minimum 30% as an average.

As regards the lab questions written weekly at the beginning of the practice, students have to write minimum 10 of them and they have to give minimum seven correct answers.

It is obligatory to attend lectures, seminars and practices. Maximum absences: 8 hours altogether.

Making up for missed classes

None.

Reading material

McMurray, Fay: Chemistry (latest edition)

Darrell D. Ebbing (Ed.): General Chemistry(latest edition)

Veronika Nagy (Ed.):Laboratory experiments in medical chemistry (Univ. Med. School of Pécs, 2010)Internet edition.

P. Gergely (Ed.): Organic and bioorganic chemistry for medical students (Univ. Med. School of Debrecen, latest edition)

P. Gergely (Ed.):Introduction to Bioinorganic chemistry for medical students (Univ. Med. School of Debrecen,latest edition)

A. Zeeck: Chemie für Mediziener (latest edition)

Lectures

1. Nitrogen-containing organic compounds.I
2. Nitrogen-containing organic compounds.II
3. Aromatic heterocyclic rings, porphyrines. I
4. Aromatic heterocyclic rings, porphyrines.II
5. Amino acids, peptides. Structure and classification of proteins. I
6. Amino acids, peptides. Structure and classification of proteins. II
7. Carbohydrates: classification and stereochemistry of monosaccharides. Oligosaccharides. I
8. Carbohydrates: classification and stereochemistry of monosaccharides. Oligosaccharides. II
9. Polysaccharides.
10. Lipids: triglicerides.
11. Phospholipids. Structure of the cell membrane.I
12. Phospholipids. Structure of the cell membrane. II
13. Test paper I. Terpenoids, carotenoids.
14. Prostaglandines.
15. Steroids, steroid hormones, bile acids. I
16. Steroids, steroid hormones, bile acids. II
17. Pyrimidine and purine bases. Nucleosides, nucleotides. Nucleic acids: primary and secondary structure.I
18. Pyrimidine and purine bases. Nucleosides, nucleotides. Nucleic acids: primary and secondary structure. II
19. Coenzymes, vitamins. I
20. Coenzymes, vitamins. II
21. Alkaloids and drugs. I
22. Alkaloids and drugs. II
23. Introduction to bioinorganic chemistry.
24. Essential elements. Elements in biological systems.
25. Test paper II. Biological role of alkali and alkaline earth metals.
26. Biochemistry of heavy metals.
27. Bioinorganic chemistry of aluminium, silicon, nitrogen, phosphorus, oxygen, selenium and halogens.I
28. Bioinorganic chemistry of aluminium, silicon, nitrogen, phosphorus, oxygen, selenium and halogens. II

Practices

1. Laboratory operations I. Demonstration: freeze-drying, distillation, evaporation.
2. Laboratory operations I. Demonstration: freeze-drying, distillation, evaporation.
3. Laboratory operations II. Recrystallisation of acetanilide. Demonstration: Soxhlet extraction.
4. Laboratory operations II. Recrystallisation of acetanilide. Demonstration: Soxhlet extraction.
5. Laboratory operations III. Isolation of caffein from tea.
6. Laboratory operations III. Isolation of caffein from tea.
7. Manifestation of secondary interactions in the physical properties of organic compounds. Analysis of organic compounds. Reactions of functional groups I.
8. Manifestation of secondary interactions in the physical properties of organic compounds. Analysis of organic compounds. Reactions of functional groups I.
9. Reactions of functional groups II.
10. Reactions of functional groups II.
11. Reactions of functional groups III.
12. Reactions of functional groups III.
13. Test paper I. Glass technology. Chromatography I.
14. Glass technology. Chromatography I.
15. Chromatography II. Demonstration: ion exchange.
16. Chromatography II. Demonstration: ion exchange.
17. Chromatography III.
18. Chromatography III.
19. Reactions of bioorganic compounds I.
20. Reactions of bioorganic compounds I.
21. Reactions of bioorganic compounds II.
22. Reactions of bioorganic compounds II.
23. Complexes I.
24. Complexes I.
25. Test paper II. Complexes II.
26. Complexes II.
27. -
28. -

Seminars

Exam topics/questions

http://www.pote.hu/index.php?page=egyseg&egy_id=20&nyelv=eng&menu=okt_anyag

OSAPF2 PREVENTIVE DENTISTRY 2

Course director: **DR. ILDIKÓ SZÁNTÓ**, clinical specialist
Dept. of Dentistry, Oral-, Maxillofacial Surgery

3 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 2

Number of hours/semester: **14 lectures + 28 practices + 0 seminars = total of 42 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

We start the studies in preventive dentistry with a review of the previous anatomical knowledge and the repeated methods of oral care. Thereafter the new preventive educational methods will be intoduced to the students.

Conditions for acceptance of the semester

All practices, 2 homework previously instructed, model of the occlusion surface of the 1st molar .

Making up for missed classes

None.

Reading material

Lectures.

Lectures

1. 1. Ergonomic guidelines in the dental treatment
2. 2. Pit-and-Fissure Sealant
3. 3. Integrated prevention and control of dental caries in children and young adults
4. 4. Caries Risk Assessment and Caries Activity testing
5. 5. Human Motivation and Behavior Changes
6. 6. Dental Public-Health Program in Childhood
7. 7. Plaque Control of the Interproximal Surfaces
8. 8. Nutrition, Diet and Oral Conditions
9. 9. Sugar and Other Sweeteners
10. 10. Preventive Oral-Health Care for Compromised Patients
11. 11. Geriatric Dental Care
12. 12. Different Dental Fields in Terms of Prevention: Pediatric Dentistry, Orthodontics
13. 13. Different Dental Fields in Terms of Prevention: Periodontology, Oral Surgery, Prosthodontics
14. 14. Rationale, Guidelines, and Procedures for Prevention

Practices

1. Hygienic requirements in the Dental Office
2. Hygienic requirements in the Dental Office
3. Review (Oral-Hygienic Methods, Equipments)
4. Review (Oral-Hygienic Methods, Equipments)
5. Pit-and-Fissure Sealing
6. Pit-and-Fissure Sealing
7. Extended Fissure Sealing
8. Extended Fissure Sealing
9. Scaling, and interproximal cleaning
10. Scaling, and interproximal cleaning
11. Dental impression, gypsum model
12. Dental impression, gypsum model
13. Dietary basics
14. Dietary basics
15. Sugar,and arteficial sweeteners
16. Sugar,and arteficial sweeteners
17. Oral-Health Promotion
18. Oral-Health Promotion
19. Promotion in Practice
20. Promotion in Practice
21. Patient referatum: surgery
22. Patient referatum: surgery
23. Patient referatum: orthodontics
24. Patient referatum: orthodontics
25. Oral-Health Promotion in Geriatric Patients

26. Oral-Health Promotion in Geriatric Patients
27. Consultations
28. Consultations

Seminars

Exam topics/questions

1. Anatomy of oral cavity
2. Localisations and directions on the dental arches. Surfaces of the teeth.
3. The aims of the prevention. The parts of prevention. The definition of primary, sesondary and tertiaty prevention
4. Basic handtools in dentistry
5. The dental surgery.
6. Personal connections of dental surgey.
7. Disinfection. Hygienic roles of dental surgery.
8. Dental deposites.
9. Mechanical plaque controll.
10. Materials of chemical plaque controll
11. The characteristics of manual toothbrush (handle, bristles, texture)
12. The ingredients of tooth pastes
13. The ingredients of mouthrinses.
14. Toothbrushing methods (Stilman, Charters, Bass). Tooth cleaning accessories.
15. Oral hygiene aids for the care and maintenance of dentures
16. Scaling methods.
17. Tools of scaling.
18. The role of dental plaque in periodontal diseases.
19. The develpoment of carious laesion.
20. Fluoride vehicles. 3 mechanism of fluoride effects against dental caries
21. The toxicity of fluorides
22. Local fluoridation
23. Systemic fluoridation
24. The technique of fissure sealing. Fissure forms. The aim of sealing
25. The DMF indexes, the definition of caries prevalency, incidency, intensity, epidemiology.
26. Caries activity tests
27. The cario-protective diet. The role of diet in caries prevention
28. Cleaning of approximal surfaces.
29. The role of sugars in caries decay formation
30. Sweeteners and the importance of sweeteners in caries prevention
31. Dental health care programmes in 2-5 year old population
32. Dental health care programmes in 6-12 year old population
33. Dental health care programmes in 12-18 year old population
34. Protocol of complex early preventive intervention (interview, oral hygiene, diet management) in pediatric dentistry
35. Protocol of orthodontic prevention
36. Protocol of oral trauma prevention
37. Protocol of caries prevention in medically compromised patients
38. Protocol of prevention in elderly people. Most common oral health problems of this age.
39. Protocol of early prevention during pregnancy
40. Protocol of tumor prevention

OSASF1 HISTOLOGY AND EMBRYOLOGY 1

Course director: **DR. PÁL TÓTH**, associate professor
Department of Anatomy

4 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 2

Number of hours/semester: **28 lectures + 28 practices + 0 seminars = total of 56 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

Basic histology (tissues). Basic embryology (embryogenesis). Microscopic and ultrastructural composition of the basic tissues. Early development of the human body, embryogenesis, external appearance of the fetus. This is the first part of a two-semester subject.

Histology is important to understand normal physiological processes on microscopic level and to explain pathological changes in diseases. Embryology helps to explain the normal anatomical situs and certain malformations, syndromes.

Conditions for acceptance of the semester

Students must make proper records with drawings in the classes. Acceptance of the records by the instructor of the group is a prerequisite for getting the signature at the end of the semester. Absences (with any reason) from no more than 15 % of the lectures and classes (max. 8x45 min = e.g. 4 weekly practices, or 3 practices and 2 lectures, etc.).

Making up for missed classes

Exceptionally, students may attend the class of another group (strictly on the same week).

Reading material

http://an-server.pote.hu

Lectures

1. Malformations and twinnings.
2. The external appearance of the embryo. Development of the skull.
3. Fetal membranes, decidua, placenta.
4. Flexion of the embryo. The umbilical cord.
5. Segmentation of the mesoderm, development of the muscular system.
6. Gastrulation and neurulation. Determination of the body axes.
7. Blastocyst formation, implantation.
8. Fertilization, segmentation. Homebox genes.
9. Progenesis I.
10. Progenesis II.
11. Review of the basic tissues.
12. Nerve tissue 2.
13. Histology of blood vessels.
14. Nerve tissue 1.
15. Haemopoiesis.
16. Blood cells.
17. The muscle tissues 1.
18. The muscle tissues 2.
19. Intracartilaginous bone formation.
20. Bone tissues. Intramembranous bone formation.
21. Histology of the cartilages.
22. Types of the connective and supportive tissues.
23. Fibers and the ground substance of the connective tissue.
24. Connective tissue cells.
25. Glandular epithelia.
26. Surface epithelia.
27. The epithelial tissues.
28. Introduction to histology. Microscopic techniques. Basic tissue types.

Practices

1. Embryology seminar.
2. Histology of the blood vessels.
3. Embryology seminar.
4. Histology of the blood vessels.
5. Blood cells. Haemopoiesis.
6. Blood cells. Haemopoiesis.

7. Nerve tissue.
8. Nerve tissue.
9. Histology of the muscle tissues.
10. Histology of the muscle tissues.
11. Bone formation.
12. Bone formation.
13. Histology of the cartilage and the bone.
14. Types of the connective tissues.
15. Histology of the cartilage and the bone.
16. Types of the connective tissues.
17. Cells and fibers of the connective tissue.
18. Cells and fibers of the connective tissue.
19. Glandular epithelia.
20. Glandular epithelia.
21. Stratified epithelia, transitional epithelium, pigmented epithelium.
22. Columnar epithelia.
23. Stratified epithelia, transitional epithelium, pigmented epithelium.
24. Simple epithelia.
25. Columnar epithelia.
26. Simple epithelia.
27. Basic histological techniques. The use of the microscope.
28. Basic histological techniques. The use of the microscope.

Seminars

Exam topics/questions
http://an-server.pote.hu

OSAAA2 ANATOMY 2

Course director: **DR. PÁL TÓTH**, associate professor
Department of Anatomy

5 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 3

Number of hours/semester: **14 lectures + 56 practices + 0 seminars = total of 70 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

Anatomy-2 involves the macroscopic structure of the human body including its functional aspects. This is the second part of a two-semester subject. Students get insight into the macroscopic structure of viscera. Anatomy-2 is completed by a semester exam.

Conditions for acceptance of the semester

Presence on at least 85% of the lectures and practices. Absences (with any reason!) from no more than 10 hours (10x45 min. = e.g. 5 weekly practices, or 4 practices and 2 lectures, etc.).

Making up for missed classes

Exceptionally, students may attend the practice of another group (on the same week).

Reading material

http://an-server.pote.hu

Lectures

1. Vascular supply and lymphatic drainage of the gastrointestinal tract. The vascular anastomoses and their clinical importance.
2. Muscles and fasciae of the pelvic floor. Perineum.
3. Obstetrical and gynecological correlates of the genital organs and perineum.
4. Gross anatomy of the male reproductive system.
5. Gross anatomy of the female reproductive system.
6. Topography, section and structure of the kidneys.
7. Topography and vascular supply of the liver and spleen. Biliary tree.
8. Retroperitoneum. Topography and parts of the pancreas.
9. Topography of the abdominal cavity. Peritoneum. Gastrointestinal tract.
10. Vascular supply and conducting system of the heart. Clinical considerations.
11. Gross anatomy of the heart, cardiac cavities and valves.
12. Lungs and pleura. Anatomy of breathing.
13. Respiratory system. Larynx and phonation.
14. Oral cavity: tongue, teeth, oropharyngeal isthmus. Pharynx.

Practices

1. Recapitulation 4.
2. Recapitulation 2.
3. Recapitulation 3.
4. Recapitulation 1.
5. Perineum, external genital organs 1.
6. Perineum, external genital organs 2.
7. Median sagittal sections of the male and female pelves 2.
8. Male and female reproductive organs 2.
9. Median sagittal sections of the male and female pelves 1.
10. Male and female reproductive organs 1.
11. Topography of the true pelvis.
12. Branches of the internal iliac artery. Sacral plexus.
13. Diaphragm.
14. Lumbar plexus.
15. Paired branches of the abdominal aorta.
16. Removal of the bowels 2.
17. Retroperitoneum.
18. Section of the kidney.
19. Removal of the bowels 1.
20. Topograpy of kidneys.
21. Vascular supply and lymphatic drainage of the small and large intestines 2.
22. Topography and vascular supply of pancreas 2.
23. Vascular supply and lymphatic drainage of the small and large intestines 1.

24. Topography and vascular supply of pancreas 1.
25. Topography, vascular supply and lymphatic drainage of duodenum and spleen.
26. Topography, surfaces, and peritoneal relations of liver.
27. Topography, vascular supply and lymphatic drainage of the stomach.
28. Hepatoduodenal ligament 1.
29. Hepatoduodenal ligament 2.
30. Coeliac trunk.
31. Structure of the abdominal wall (repetition).
32. Regions of the abdominal cavity. Surface projections of the intraabdominal viscera.
33. Posterior mediastinum 3.
34. Posterior mediastinum 4.
35. Posterior mediastinum 1.
36. Posterior mediastinum 2.
37. Lungs and bronchi 1.
38. Lungs and bronchi 2.
39. The heart. Topography and X-ray picture.
40. Cavities, valves and vascular supply of the heart 1.
41. Cavities, valves and vascular supply of the heart 2.
42. Term and division of the mediastinum.
43. Anterior mediastinum 1.
44. Anterior mediastinum 2.
45. Surface projections and topography of the intrathoracic viscera 1.
46. Surface projections and topography of the intrathoracic viscera 2.
47. Structure of the chest wall. Intercostal nerves and vessels 1.
48. Structure of the chest wall. Intercostal nerves and vessels 2.
49. Larynx 1.
50. Larynx 2.
51. Nasal cavity 2.
52. Pharynx. Retro- and parapharyngeal spaces 1.
53. Pharynx. Retro- and parapharyngeal spaces 2.
54. Oral cavity and teeth 1.
55. Oral cavity and teeth 2.
56. Nasal cavity 1.

Seminars

Exam topics/questions

http://an-server.pote.hu

OSABK1 BIOCHEMISTRY 1

Course director: **GALLYAS FERENC DR. JR.**, professor
Department of Biochemistry and Medical Chemistry

5 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 3

Number of hours/semester: **42 lectures + 28 practices + 0 seminars = total of 70 hours**

Headcount limitations (min-max.): **5 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

The subject covers the principles of chemical/biochemical processes occurring in living organisms.

The 1st semester of the 2-semester Biochemistry course deals with the fundamental metabolic processes and with the function, structure and regulation of the enzymes, transporters and other proteins which participate in the above mentioned processes. The subject reveals the physical, chemical, thermodynamical and reaction-kinetical laws and rules of the essential metabolic processes and describes the structural characteristics of the participating small molecules.

The subject lies down the foundations of the subjects Biochemistry 2, Pharmacology and Clinical Chemistry.

Conditions for acceptance of the semester

It is mandatory to attend the lectures and laboratory practices.

Requirements of the acceptance of Biochemistry 1 course are the following:

- No more than three absences from the laboratory practices
- Submission of at least 10 out of 12 short tests held in the first 10 minutes of the practices
- Achieving satisfactory level in at least seven of the 12 short tests

Making up for missed classes

Permission should be asked from the course director to do the practice with another group. Permission will be given maximum 2 times.

Reading material

Nelson - Cox: Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman, 2008.

Berg - Tymoczko - Stryer: Biochemistry, 6th Ed, W.H. Freeman, 2007.

Devlin: Textbook of Biochemistry with Clinical Correlations, 6th Ed, Wiley-Liss, 2006

Experimental Biochemistry, Edited by Dénes Szabó, 1990

Lectures

1. Structure and function of proteins, peptides
2. Folding, the role of chaperons
3. Energetics
4. Basics of enzymatic catalysis (Farkas Viktória)
5. Regulation of enzymes, isoenzymes
6. Hemoglobin, oxygen transport
7. Proteins of the immune system
8. Glycolysis I. (Farkas Viktória)
9. Glycolysis II. (Farkas Viktória)
10. Metabolic pathways coupled to the glycolysis (Veres Balázs)
11. Characterization of lipids, biological membranes (Veres Balázs)
12. Fatty acid oxidation (Veres Balázs)
13. The pyruvate dehydrogenase complex (PDC)
14. Reactions of the citric acid cycle
15. Regulation of the citric acid cycle
16. Respiratory chain and its inhibition
17. ATP synthesis
18. Mitochondrial transport processes, shuttles (Veres Balázs)
19. Supramolecular organization of functionally related enzymes
20. Reactive oxygen species (ROS)
21. Photosynthesis, light reaction (Veres Balázs)
22. Gluconeogenesis in plant cells from CO2 (dark reaction) and from acetate (Veres Balázs)
23. Gluconeogenesis in animal cells
24. Pentose phosphate cycle (Farkas Viktória)
25. Monosaccharides, disaccharides, UDP mechanisms (Veres Balázs)
26. Glycogen synthesis and degradation
27. Concerted regulation of glycogen synthesis and degradation
28. Fatty acid (palmitic acid) synthesis

29. Elongation and desaturation of fatty acids, formation of biologically active molecules
30. Synthesis of complex lipids
31. Synthesis of cholesterol and ketone bodies
32. Regulation and disorders of lipid metabolism
33. Regulation and disorders of carbohydrate metabolism
34. Amino acid metabolism; the fate of the amino group (Debreceni Balázs)
35. Urea cycle (Debreceni Balázs)
36. Amino acid metabolism; the carbon skeleton (Debreceni Balázs)
37. Synthesis of non-essential amino acids (Debreceni Balázs)
38. Enzymopathies of amino acid metabolism (Debreceni Balázs)
39. Synthesis of biologically active molecules from amino acids (Debreceni Balázs)
40. Synthesis of purine and pyrimidine bases and nucleotides (Farkas Viktória)
41. Degradation of purine and pyrimidine bases and nucleotides (Farkas Viktória)
42. Overview of metabolism

Practices

1. Preparation of buffer solutions
2. Preparation of buffer solutions
3. Properties of the proteins
4. Properties of the proteins
5. Determination of protein concentration (Biuret method)
6. Determination of protein concentration (Biuret method)
7. Basic biochemical laboratory techniques
8. Basic biochemical laboratory techniques
9. Exploration of the contents of a cell, subcellular fractionation
10. Exploration of the contents of a cell, subcellular fractionation
11. Cell cultures
12. Cell cultures
13. Polyacrylamide gel electrophoresis, Western Blot
14. Polyacrylamide gel electrophoresis, Western Blot
15. Heart perfusion
16. Heart perfusion
17. SH-Enzymes, Warburg`s optical test
18. SH-Enzymes, Warburg`s optical test
19. Study of the mitochondrial respiration (Clark electrode)
20. Study of the mitochondrial respiration (Clark electrode)
21. Enzyme kinetics, study of enzymatic inhibition
22. Enzyme kinetics, study of enzymatic inhibition
23. Noninvasive biochemical analysis
24. Noninvasive biochemical analysis
25. Affinity chromatography, study of Complex I
26. Affinity chromatography, study of Complex I
27. Consultation
28. Consultation

Seminars

Exam topics/questions

The list of topics of the exam questions are identical to the list of the lectures.

The exams, including the retaken exams are written exams of 30 open questions. Failure to answer more than two of the first 7 questions will automatically result in ‘failed’ grade.

OSAET1 PHYSIOLOGY 1

Course director: **DR. ZOLTÁN KARÁDI**, professor
Department of Physiology

8 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 3

Number of hours/semester: **70 lectures + 42 practices + 0 seminars = total of 112 hours**

Headcount limitations (min-max.): **5 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

The student has to know the functions and functional mechanisms of the organs, organ systems and the human body as a whole.

The student is required to understand and present

-the regulatory mechanisms of different physiological functions of the human body,

-the regulation of the integrated functions of the individual organs and organ systems,

-and the interrelationships among different control mechanisms in the human body including all the relevant chemical, biochemical, biological and anatomical data.

Conditions for acceptance of the semester

According to the Bylaws of the University of Pécs, Medical School (Code of Studies and Examinations), students are required to attend the lectures and practical classes. Students are required to perform the prescribed practical excercises and to keep a record of them. Missed classes must be made up.

Students are required to give account of their theoretical and practical knowledge during the semester. Exams can be taken only after fulfilling the above prerequisites.

The result of the exam will be based on the combined results of the mid-term tests and the exam performance.

Making up for missed classes

The missed lab practice must be covered by joining another group while the same topic is on schedule.

Reading material

W.F. Ganong: Review of Medical Physiology, Appleton and Lange, Lange Medical Publications, 1990-2006

A.C. Guyton: Textbook of Medical Physiology, W.B. Saunders Company, 1996-2006

J.B. West (ed.): Best and Taylor's Physiological Basis of Medical Practice, Williams and Wilkins, 1990-1998

Fonyó: Principles of Medical Physiology, Medicina Kiadó 2002

Physiology exercises

Laboratory exercises in physiology 1st Semester

Lectures

1. Introduction. The concept of homeostasis
2. Fluid distribution in the body. The blood.
3. Blood constituents.
4. Structure and metabolism of haemoglobin. Metabolism of iron
5. Mechanism of blood coagulation
6. Leukocytes I
7. Leukocytes II
8. AB0 blood groups
9. Rh blood groups
10. The cardiac cycle. Generators and conductors of impulses in the heart
11. Mechanical activity of the heart
12. Electrocardiogram I.
13. Electrocardiogram II.
14. Heart sounds. Phonocardiography.
15. Cardiac output and cardiac work
16. Distribution of blood volume, pressure flow and resistance
17. Blood pressure. Arterial pulse
18. Circulation through the capillaries
19. Circulation in the veins. Determinants of venous pressure
20. The formation, pressure and flow of lymph
21. Pulmonary circulation, cerebral circulation.
22. Circulation through skin and skeletal muscle. Splanchnic circulation
23. Neural and humoral regulatory mechanisms of the cardiovascular system
24. Homeostatic regulation of the cardiovascular system
25. Mechanics of respiration

26. Intrathoracic pressure. Compliance. Respiratory volumes. Dead spaces
27. Gaseous exchange in the lungs and tissues
28. O2 and CO2 transport mechanism and pH regulation
29. Chemical control of respiration
30. Neural regulatory mechanisms of respiration
31. Mechanisms of acclimatisation
32. The gastrointestinal tract. Function and control of salivary secretion
33. The stomach. Gastric secretion
34. Duodenal processes. Biliary secretion
35. Secretion and absorption in the small intestine
36. Secretion and absorption in the large intestine. Formation of the faeces
37. Humoral and neural control of the gastrointestinal system
38. Digestion and absorption of different nutrients
39. Vitamins
40. Liver functions I
41. Liver functions II
42. Dynamics of glomerular filtration. Plasma clearance
43. Renal blood flow. Extraction ratio. Filtration fraction
44. Renal circulation
45. The renin-angiotensin system
46. Tubular processes
47. Concentrating and diluting mechanisms
48. Fluid volume regulation of the body
49. The mechanisms of urination
50. Acid-base regulation I
51. Acid-base regulation II
52. Energy balance. Metabolism
53. Nutrition
54. Body temperature of man. Hyperthermia, fever
55. Peripheral control of body temperature
56. Central control mechanisms of body temperature
57. The hypothalamo-hypophyseal system
58. Anterior pituitary hormones
59. Cellular mechanisms of hormone action I
60. Cellular mechanisms of hormone action II
61. Hormonal regulation of female sexual functions
62. Pregnancy
63. Lactation
64. Hormonal regulation of male sexual function
65. Erection, ejaculation, coitus
66. Humoral and central neural control of sexual behaviour
67. Puberty. Climacteric
68. Thyroid physiology I.
69. Thyroid physiology II.
70. Functions of posterior lobe of pituitary gland

Practices

1. Getting acquainted with the laboratory. General information, schedules. Personal- and equipment safety rules. Animal care regulations.
2. Blood I.
3. Blood I.
4. Blood II.
5. Blood II.
6. Blood II.
7. Blood III.
8. Blood III.
9. Blood III.
10. Blood IV.
11. Blood IV.
12. Blood IV.

13. Seminar: Blood (Discussion of the topics covered by the lectures and student labs)
14. Seminar: Blood (Discussion of the topics covered by the lectures and student labs)
15. Test on the chapter
16. The heart and circulation I.
17. The heart and circulation I.
18. The heart and circulation I.
19. The heart and circulation II.
20. The heart and circulation II.
21. The heart and circulation II.
22. The heart and circulation III.
23. The heart and circulation III.
24. The heart and circulation III.
25. The heart and circulation IV.
26. The heart and circulation IV.
27. The heart and circulation IV.
28. Seminar: The heart and circulation
29. Seminar: The heart and circulation
30. Test on the chapter
31. Respiration
32. Respiration
33. Respiration
34. Gastrointestinal tract
35. Gastrointestinal tract
36. Gastrointestinal tract
37. Examination of the urine
38. Examination of the urine
39. Examination of the urine
40. Measurement of the actual metabolic rate in human
41. Measurement of the actual metabolic rate in human
42. Measurement of the oxigen consumption in the rat.

Seminars

Exam topics/questions

Topics of questions for the theoretical examination

1. Describe the body fluid compartments and explain the methods used for measurement of body fluid volumes
2. Describe the major plasma proteins and the other non-electrolytic constituents of blood and explain their function in the body
3. Describe the intra- and extracellular ionic components and explain their physiological functions
4. The structure, function and origin of erythrocytes
5. Characterize the various leukocytes indicating their origins and functions
6. Origin and function of blood platelets
7. The basic structure and metabolism of haemoglobin and the metabolism of iron
8. Describe the two pathways involved in the initiation of blood coagulation
9. Specific mechanism of clot formation
10. Describe the mechanism of fibrinolysis. Explain the significance of anticlotting mechanism
11. Regulation of H+ ion concentration in the blood
12. A-B-0 blood groups. The Rh blood types
13. The role of leukocytes in the defence mechanism
14. Mechanical activity of the heart and the three-component model of heart muscle. Calcium ion movements within the cardiac muscle cell
15. Generators and conductors of impulses in the heart. Refractory periods
16. The sequence of events in the cardiac cycle
17. The human electrocardiogram (ECG). Electrocardiography: bipolar and unipolar leads
18. The heart sounds. Phonocardiography (PCG)
19. Cardiac output: measurement, normal standards and physiological variations
20. Metabolism and energetics of cardiac muscle
21. Ventricular wall tension and the Laplace relationship
22. The heart-lung preparation (Starling's laws)
23. Arterial blood pressure: determinants of normal arterial blood pressure
24. The arterial and the venous pulse. Basic principles of hemodynamics.

25. Circulation through the capillaries
26. The properties, production and the movement of lymph
27. Circulation in the vein. Effect of gravity on circulation
28. The pulmonary circulation. Control of lung vessels
29. The coronary circulation
30. Cerebral circulation. The concept of 'blood-brain barrier'
31. Splanchnic circulation
32. Skeletal muscle circulation. Cutaneous circulation
33. Nervous control of the heart
34. Control mechanisms of the circulatory system: general considerations
35. Local control of the vascular smooth muscle
36. Autoregulation of blood flow in tissues and organs
37. The function and importance of baroreceptors in the regulation of circulation
38. Reflex control mechanisms of circulation
39. Mechanisms of vasoconstriction and vasodilatation
40. Mechanics of respiration (functions of respiratory muscles, compliance, intrathoracic pressures, respiratory volumes)
41. Alveolar air, alveolar ventilation, dead spaces. Function of the respiratory passageways
42. Gaseous exchange in the lungs and tissues
43. O2 and CO2 transport in the body
44. Peripheral and central regulatory mechanisms of respiration. Respiratory reflexes
45. Chemical control of respiration. Acidosis, alkalosis
46. Different types of hypoxia. Oxygen treatment. Mechanisms of acclimatisation. Nitrogen narcosis. Decompression sickness
47. Describe the origin, composition, function and control of salivary secretion
48. Describe the origin, nature and function of gastric secretion indicating the mechanisms of regulation
49. Mechanism and regulation of gastrointestinal movements
50. Identify the pancreatic secretions, their components, their action and the substrates on which they act. Control mechanism of pancreatic secretion
51. Describe the basic ingredients and functions of the bile indicating the origin and fate of the components and the factors controlling bile secretions and gall bladder functions
52. Identify the components and functions of the intestinal system
53. Describe how carbohydrate is digested and absorbed indicating the enzymes involved
54. Describe how fat is digested and absorbed indicating the enzymes and secretions involved
55. Describe how protein is digested and absorbed indicating the enzymes and secretions involved
56. Dynamics of glomerular filtration. Glomerular filtration rate. Plasma clearance
57. Renal blood flow. Clearance of PAH. Extraction ratio. Filtration fraction
58. Regulation of renal blood flow and pressure. Renin-angiotensin system
59. Reabsorption and secretion of different substances in the renal tubule. Methods for their investigation
60. Concentrating and diluting mechanisms of the kidney
61. Fluid volume regulation of the body
62. Regulation of concentrations of ions in the extracellular fluid. Regulation of osmolality of body fluids
63. Basal metabolic rate. Describe factors influencing the basal metabolism
64. Define metabolic rate explaining those factors influencing the total expenditure of energy by the body
65. Describe the necessary elements of normal diet
66. The normal body temperature and its physiological variations. Hyperthermia, fever, hypothermia
67. Chemical regulation of body temperature, changes of regulation at low and high environmental temperature
68. Physical regulation of body temperature, changes of regulation at low and high environmental temperature
69. Central regulatory mechanisms of heat production and heat loss
70. Mechanisms of hormone action (receptors, intracellular mediators, cAMP, Ca2+ and diacylglycerol, protein kinases)
71. Mechanism of hormonal regulation. Negative and positive feedback controls in the endocrine system
72. The anterior pituitary hormones. Regulation of pituitary hormone secretions. Pituitary dysfunction
73. Function of growth hormone during development and after adolescence
74. Abnormalities of thyroid secretion. Goitrogens
75. Function of the thyroid gland. Iodine metabolism in the body
76. Hormonal changes during menstrual cycle
77. Hormonal changes during pregnancy. Role of placenta in pregnancy. Foeto-placental unit
78. Hormones of lactation
79. Mechanism of erection and ejaculation. The sexual act (coitus)
80. The function of testis, epididymis, seminal vesicle and prostate
81. Regulation of the sexual behaviour. Maternal behaviour

82. Physiological changes at puberty and climacteric
83. Vasopressin and oxytocin. Function of ANH (atrionatriuretic hormone)
84. The effects of prostaglandins

Topics of questions for the student lab examination

1. Determine the bleeding time, clotting time and the prothrombin time (prothrombin-index)
2. Determination of protein content of serum
3. Describe the principle and the technique of the packed cell volume (haematocrit) determination
4. Determine the specific gravity of the blood (according to Hammerschlag). Determine the specific gravity of the blood and the blood plasma (according to Phillips-Van Slyke)
5. Determination of osmotic resistance of red blood cells
6. How do you determine the erythrocyte sedimentation rate of a blood sample?
7. How do you determine the haemoglobin content of the blood? Spectroscopic examination of gas-compounds of haemoglobin
8. How do you determine the red blood cell count?
9. How do you determine the white blood cell count?
10. Determine the diameter and volume of red blood cells. Mean haemoglobin content (MCH) and haemoglobin concentration (MCHC) of erythrocytes
11. How do you make a blood film? Describe the morphological and staining characteristics of the different white blood cell types. Give the differential leukocyte count
12. How do you determine the reticulocyte count? How do you determine the platelet count?
13. How do you perform A, B, 0 and AB blood grouping?
14. How do you perform Rh blood grouping?
15. Electric and thermal stimulation of the heart. Demonstration of extrasystole
16. Experiments on the excitatory and conductive system of the heart (ligatures of Stannius). Demonstration of the 'all or nothing' law. Summation
17. Electrocardiogram. Recording of ECG
18. Heart sounds (phonocardiogram)
19. Effects of vagal and sympathetic stimulation on the heart. Goltz reflex
20. Experiments on isolated frog's heart by means of Straub cannula. Effects of different ions on isolated heart. Examination of effects of acetylcholine and adrenaline
21. Demonstration of neurotransmission on frog's heart after Loewi
22. Study of peripheral circulation in frog's blood vessels (examination of frog's tongue; experiment of Laewen and Trendelenburg)
23. Examination of the arterial pulse. Index of physical condition
24. Methods for measuring blood pressure in humans
25. Direct measurement of blood pressure in animal experiment
26. Thoracic percussion and auscultation
27. Spirometry. Volumes and capacities of the lungs. Vital capacity
28. Determination of respiration pressure. Donders model
29. Effects of respiration on the filling of the heart (experiments of Müller and Valsalva)
30. Examination of saliva
31. Determination of gastric acid secretion (BAO, MAO, PAO)
32. Determination of lactic acid and pepsin
33. Examination of the exocrine pancreas. Amylase determination in the serum and urine
34. Examination of bile. Determination of bile pigments
35. Examination of faeces
36. How do you perform a routine urinary screening?
37. How do you determine the specific gravity of urine?
38. Examination of protein, glucose and ketone bodies in the urine
39. Determination of haemoglobin, bilirubin and urobilinogen in the urine
40. How do you examine urine sediment?
41. Determination of basal metabolic rate. Measurement of oxygen consumption in rat

OSASF2 HISTOLOGY AND EMBRYOLOGY 2

Course director: **DR. PÁL TÓTH**, associate professor
Department of Anatomy

4 credit ▪ semester exam ▪ Basic module ▪ autumn semester ▪ recommended semester: 3

Number of hours/semester: **28 lectures + 28 practices + 0 seminars = total of 56 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

Histology of the internal organs. Microscopical and fine structure of lymphatic organs and viscera together with their basic functional significance. Formation of organs and organ-systems (organogenesis)and their further development in the embryonal and fetal period. This is the second part of a two-semester subject.

Histology is important to understand normal physiological processes on microscopic level and to explain pathological changes in diseases. Embryology helps to explain the normal anatomical situs and certain malformations, syndromes.

Conditions for acceptance of the semester

Students must make proper records with drawings in the classes. Acceptance of the records by the instructor of the group is a prerequisite for getting the signature at the end of the semester. Absences (with any reason) from no more than 15 % of the lectures and classes (max. 8x45 min = e. g. 4 weekly practices, or 3 practices and 2 lectures, etc.).

Making up for missed classes

Exceptionally, students may attend the practice of another group on the same week.

Reading material

http://an-server.pote.hu/

Lectures

1. Lymphatic tissues and their functions.
2. Histology of the lymphatic organs.
3. Histology and development of the teeth.
4. Histology of the oral cavity, tongue and salivary glands.
5. Histology of the respiratory system.
6. Development of the respiratory system.
7. Development of the face and the oral and nasal cavity. Malformations.
8. Development and derivatives of the pharyngeal gut.
9. Histology and histophysiology of the esophagus and the stomach.
10. Histology of the intestines.
11. Early development of the heart. Development of sinus venosus and the interatrial septum.
12. Development of the ventricles.
13. Branchial arteries and their derivatives. Formation of the venous system.
14. Fetal circulation. Movie demonstrating the development of the heart.
15. Histology of the liver and the pancreas.
16. Development of the intestinal system, liver and pancreas.
17. Histology of the kidney.
18. Histology of ureter and urinary bladder. Development of the kidney.
19. Histology of the ovary. Follicular development.
20. Histology of the uterine tube, uterus and vagina. Cyclic changes of the endometrium.
21. The pregnant uterus, the placenta and the breast.
22. Histology of male reproductive system I.
23. Histology of male reproductive system II.
24. Development of reproductive organs I.
25. Development of reproductive organs II.
26. Development of the peritoneum. Separation of the body cavities.
27. Clinical importance of the histology of the kidney. (Degrell Péter Dr.)
28. Parallelly developing organ systems. (Recapitulation of embryology).

Practices

1. Histology of the male reproductive organs II.
2. Histology of the male reproductive organs II.
3. Histology of the male reproductive organs I.
4. Histology of the male reproductive organs I.
5. Histology of the pregnant uterus, the placenta, the umbilical cord and the breast.
6. Histology of the pregnant uterus, the placenta, the umbilical cord and the breast.

7. Histology of the female reproductive organs.
8. Histology of the female reproductive organs.
9. Histology of the kidney, the ureter and the urinary bladder.
10. Histology of the kidney, the ureter and the urinary bladder.
11. Histology of liver, gall bladder and the pancreas.
12. Histology of liver, gall bladder and the pancreas.
13. Development of the heart. Embryology seminar.
14. Development of the heart. Embryology seminar.
15. Recapitulation of basic histology.
16. Recapitulation of basic histology.
17. Histology of the lymphatic organs.
18. Histology of the lymphatic organs.
19. Histology of lip and teeth. Development of the teeth.
20. Histology of lip and teeth. Development of the teeth.
21. Histology of the salivary glands and the tongue.
22. Histology of the salivary glands and the tongue.
23. Histology of the respiratory system.
24. Histology of the respiratory system.
25. The esophagus and the stomach.
26. The esophagus and the stomach.
27. Small and large intestines.
28. Small and large intestines.

Seminars

Exam topics/questions
http://an-server.pote.hu/

OSAANY DENTAL MATERIALS

Course director: **DR. GYULA SZABÓ**, professor
Dept. of Dentistry, Oral-, Maxillofacial Surgery

2 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **28 lectures + 0 practices + 0 seminars = total of 28 hours**

Headcount limitations (min-max.): **2 – 30**

Prerequisites: **see in the recommended curricula!**

Topic

Students should acquire the materials and measuring methods used in dentistry. Standards, physical, chemical and mechanical properties are also under rewiev.

Conditions for acceptance of the semester

Based on the Code of Studies and Examinations.

Making up for missed classes

None.

Reading material

Dental materials and their selection Williem J. O'Brien

Lectures

1. Introduction. Alignment of dental materials. Physical and mechanical properties.
2. Standards and tests
3. Dental cements part one
4. Dental waxes
5. Dental cements part two
6. Gypsum products
7. Dental cements part three
8. Reversible and irreversible hydrocolloids
9. Dental amalgam
10. Nonaqeuos elastomer impression materials
11. Physico-mechanical properties of amalgam
12. Non-elastic impression materials, zinc oxide-eugenol
13. Toxicity of amalgam
14. Polymers and polymerization, general properties of denture base polymers
15. Polymeric restorative materials
16. Artificial teeth and denture base materials
17. Resin composites
18. Precious metal casting alloys
19. Compomers, ormocers
20. Alloys for metal-ceramic restorations, base metal casting alloys
21. Guttapercha
22. Palladium-silver alloys, titanium
23. Sealers
24. Stainless steel
25. Provisional filling materials
26. Dental porcelain
27. Para- and intrapulpal posts
28. Investment materials

Practices

Seminars

Exam topics/questions

1. Calcium hydroxide chelate cements
2. ZnO eugenol cements
3. Zinc phosphate cements
4. Zinc polycarboxylate cements
5. Glass ionomer cements (1-3rd generations)
6. Glass ionomer cements (4th generation)
7. Base, liner materials
8. Polymerization in operative dentistry

9. Dentin and enamel bonding agents
10. Composition and reaction of resin composites, the organic matrix
11. Composition and reaction of resin composites, the filler composition and coupling agents
12. Mechanical and thermal properties of resin composites
13. Polymerization shrinkage, water sorption and solubility of resin composites
14. Setting time of resin composites, shear bond strength
15. Accelerators, inhibitors (composites)
16. Classification of amalgam alloys
17. High copper amalgams
18. Toxicity of amalgams
19. Plasticity, condensation and finishing of amalgams
20. Setting reactions of amalgams
21. Mechanical and physical properties of amalgams
22. The types of gutta percha
23. Root canal sealers
24. Provisional filling materials, types and properties
25. Parapulpal posts
26. Intrapulpal posts
27. Compomers, ormocers
28. Dental gypsum products
29. Reversible hydrocolloids
30. General properties of silicone impression materials
31. Thermoplastic impression materials
32. Zinc oxid-eugenol pasts
33. Dental waxes
34. Standards in dentistry, tests of dental materials
35. General properties of nonaqueous elastomers
36. Main features of different dental material groups, physical, chemical and mechanical properties
37. Polyethers and polysulfides
38. Metal alloys is prosthetic dentistry
39. General properties of dental alloys, grain structures of alloys
40. Dental ceramics
41. General properties of dental polymers
42. Classification of polymers used in prosthodontics
43. Investing materials
44. Dental noble alloys, alloys for porcelain-fused-to-metal restorations
45. Palladium-silver alloys
46. Nickel-chromium alloys, alloys for porcelain-fused-to-metal restorations
47. Cobalt-chromium alloys
48. Biocompatibility of dental alloys
49. Provisional crown and bridge materials
50. Mechanical properties of dental metals and alloys
51. Stainless steel
52. Irreversible hydrocolloids
53. Instruments and materials of finishing and polishing
54. Porcelain-metal compatibility and the adhesion to metal theories of porcelain
55. Processing of silicone impression materials
56. Condensation silicones
57. Addition (vinyl) silicones

OSABK2 BIOCHEMISTRY 2

Course director: **GALLYAS FERENC DR. JR.**, professor
Department of Biochemistry and Medical Chemistry

5 credit ▪ final exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **42 lectures + 28 practices + 0 seminars = total of 70 hours**

Headcount limitations (min-max.): **5 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

The subject serves as a foundation for the preclinical subjects Pathobiochemistry, Pharmacology, Pathophysiology, and the clinical subjects Internal Medicine, Clinical Chemistry and Neurology.

The 2nd semester of the 2-semester Biochemistry course - based on the material covered by the 1st semester - gives a deeper view into the fundamentals of structure-function relationships of small- and macromolecules, especially focusing on the structure, function and regulation of the molecules that are involved in the storage and transmission of genetic information, and dealing with basic molecular biology techniques. Furthermore, the regulation mechanisms of metabolic, hormonal and signal transduction pathways on the levels of the cell as well as of the organism are covered. The special biochemical characteristics of the different organs are also discussed.

Conditions for acceptance of the semester

It is mandatory to attend the lectures and laboratory practices.

Requirements of the acceptance of Biochemistry 2 course are the following:

- No more than three absences from the laboratory practices
- Submission of at least 10 out of 12 short tests held at the first 10 minutes of the practices
- Achieving satisfactory level in at least seven of the 12 short tests

Making up for missed classes

Permission should be asked from the course director to do the practice with another group. Permission will be given maximum 2 times.

Reading material

Nelson - Cox: Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman, 2008.

Berg - Tymoczko - Stryer: Biochemistry, 6th Ed, W.H. Freeman, 2007.

Devlin: Textbook of Biochemistry with Clinical Correlations, 6th Ed, Wiley-Liss, 2006

Experimental Biochemistry, Edited by Dénes Szabó, 1990

Lectures

1. Genes and chromosomes
2. DNA replication
3. DNA repair
4. RNA metabolism I (Veres Balázs)
5. RNA metabolism II (Veres Balázs)
6. Retroviruses
7. Protein synthesis I
8. Protein synthesis II
9. Posttranslational modifications of proteins
10. Protein targeting and transport
11. Regulation of gene expression I
12. Regulation of gene expression II
13. The mitochondrial protein synthesis and the disorders of the mitochondrial genome (Veres Balázs)
14. Recombinant DNA technologies (Debreceni Balázs)
15. The cell cycle and its regulation (Farkas Viktória)
16. Hormones I.
17. Hormones II. (Debreceni Balázs)
18. Hormones III, PPARs
19. Cell signalling, the CO and NO as signals, transcription factors (Veres Balázs)
20. Cell signalling induced by oxidative stress
21. Biochemistry of septic shock (Veres Balázs)
22. Oncogenes and oncogenesis (Debreceni Balázs)
23. Tumor supressors and cancer (Debreceni Balázs)
24. Structure of the extracellular matrix (Farkas Viktória)
25. Cell signalling, kinases

26. Genetic disorders of hemoglobin
27. Regulation of Fe metabolism, related diseases
28. Biochemistry of digestion: macronutrrients (Farkas Viktória)
29. Biochemistry of digestion: micronutrrients
30. Special functions of liver
31. Serum lipoproteins (Debreceni Balázs)
32. Changes accompanying the switch from fed to fasting state
33. Biochemistry of the immune system
34. Water soluble vitamins (Farkas Viktória)
35. Lipid soluble vitamins (Farkas Viktória)
36. Biochemistry of the senses
37. Nervous system I.
38. Nervous system II.
39. Molecular targets of drug-development
40. Genomics, proteomics, metabolomics
41. Current chances for gene therapy and for tumor therapy
42. Current theories about the origin of life and evolution

Practices

1. The inorganic phosphate requirement of the glycolysis
2. The inorganic phosphate requirement of the glycolysis
3. MPT in apoptosis and necrosis
4. MPT in apoptosis and necrosis
5. Study of body fluids
6. Study of body fluids
7. Molecular biology methods
8. Molecular biology methods
9. Determination of blood glucose
10. Determination of blood glucose
11. Advanced biotechnology
12. Advanced biotechnology
13. Determination of blood cholesterol
14. Determination of blood cholesterol
15. Genomics, proteomics, bioinformatics
16. Genomics, proteomics, bioinformatics
17. Determination of uric acid in blood
18. Determination of uric acid in blood
19. Hereditary metabolic diseases
20. Hereditary metabolic diseases
21. Determination of bilirubin in blood
22. Determination of bilirubin in blood
23. Acquired metabolic diseases
24. Acquired metabolic diseases
25. Study of cholinesterase
26. Study of cholinesterase
27. Consultation
28. Consultation

Seminars

Exam topics/questions

The list of exam topics is identical to the list of the titles of lectures of both semesters.

The exams, including the retaken exams are written exams of 40 open questions. Failure to answer more than three of the first 10 questions will automatically result in 'failed' grade.

OSAET2 PHYSIOLOGY 2

Course director: **DR. ZOLTÁN KARÁDI**, professor
Department of Physiology

8 credit ▪ final exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **70 lectures + 42 practices + 0 seminars = total of 112 hours**

Headcount limitations (min-max.): **5 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

The student has to know the functions and functional mechanisms of the organs, organ systems and the human body as a whole.

The student is required to understand and present

-the regulatory mechanisms of different physiological functions of the human body,

-the regulation of the integrated functions of the individual organs and organ systems,

-and the interrelationships among different control mechanisms in the human body including all the relevant chemical, biochemical, biological and anatomical data.

Conditions for acceptance of the semester

According to the Bylaws of the University of Pécs, Medical School (Code of Studies and Examinations), students are required to attend the lectures and practical classes. Students are required to perform the prescribed practical excercises and to keep a record of them. Missed classes must be made up.

Students are required to give account of their theoretical and practical knowledge during the semester. Exams can be taken only after fulfilling the above prerequisites.

The result of the exam will be based on the combined results of the mid-term tests and the exam performance.

Making up for missed classes

The missed lab practice must be covered by joining another group while the same topic is on schedule.

Reading material

W.F. Ganong: Review of Medical Physiology, Appleton and Lange, Lange Medical Publications, 1990-2006

A.C. Guyton: Textbook of Medical Physiology, W.B. Saunders Company, 1996-2006

J.B. West (ed.): Best and Taylor's Physiological Basis of Medical Practice, Williams and Wilkins, 1990-1998

Fonyó: Principles of Medical Physiology, Medicina Kiadó 2002

Laboratory exercises in physiology 2nd Semester (Endocrinology)

Lectures

1. Endocrinology of the adrenal cortex I
2. Endocrinology of the adrenal cortex II
3. Endocrinology of the adrenal cortex III
4. The adrenal medulla. Endocrinology of stress
5. Hormonal control of calcium homeostasis
6. The endocrine pancreas
7. Hormonal control of intermediary metabolism I.
8. Hormonal control of intermediary metabolism II.
9. Special problems of neonatal physiology
10. Physiology of ageing
11. Ionic mechanism of membrane potential
12. Action potential and its propagation
13. Function of neuromuscular junction
14. Electrophysiology of interneuronal synapses
15. Neurochemical basis of neurotransmission
16. General properties of spinal cord reflexes
17. Integrative functions of the spinal cord
18. The motor unit. Peripheral neural mechanism of muscle control
19. Functional importance of mechanoreceptors
20. Somaesthetic mechanism
21. Somatotopic representations in the sensory systems
22. Thalamocortical somatosensory functions. The sensory cortex
23. Pain mechanism
24. Molecular mechanism of muscle contraction
25. Mechanical characteristics of muscle

26. The source of energy for muscle contraction. Heat production
27. Electromyography. Control of muscle contraction; muscle tone, fatigue
28. Contraction of smooth muscle
29. The spinal shock
30. Decerebrate rigidity
31. Postural co-ordination, locomotion
32. Extrapyramidal system I.
33. Extrapyramidal system II.
34. Physiology of the vestibular system
35. Cerebellar control of motor functions I
36. Cerebellar control of motor functions II
37. Cortical control of motor functions. The pyramidal system
38. Optics of vision
39. Retinal mechanism
40. Visual pathways, midbrain mechanism of vision
41. Central mechanism of vision
42. Eye movements and their control
43. Physiology of hearing I
44. Physiology of hearing II
45. Central auditory mechanisms
46. The chemical senses I. Olfaction
47. The chemical senses II. Taste
48. The autonomic nervous system I
49. The autonomic nervous system II
50. Electroencephalography I
51. Electroencephalography II
52. Neural control mechanism of sleep
53. Clinical importance of the evoked potential technique
54. The diencephalon (hypothalamus). Its motor, autonomic and hormonal regulatory functions
55. The concept of drive and motivation
56. Homeostatic drives. Central neural regulation of hunger and thirst
57. Control of biological rhythms
58. The limbic system I
59. The limbic system II
60. Monoaminergic systems and their functions
61. Emotions and their central nervous mechanism
62. Mechanism of learning I
63. Mechanism of learning II
64. Types and disorders of memory functions I
65. Types and disorders of memory functions II
66. Plasticity of the peripheral and central nervous system
67. Intrinsic cortical mechanism. Functions of the frontal lobe
68. The parieto-temporal lobe
69. Cerebral dominance
70. Neurophysiological mechanisms of speech. Speech disorders

Practices

1. The endocrine pancreas
2. The endocrine pancreas
3. The endocrine pancreas
4. Reproduction
5. Reproduction
6. Reproduction
7. Peripheral nervous system I.
8. Peripheral nervous system I.
9. Peripheral nervous system I.
10. Peripheral nervous system II.
11. Peripheral nervous system II.
12. Peripheral nervous system II.
13. Seminar: Endocrinology, Peripheral nerve, Membrane potential, Action potential, Synaptic transmission

14. Seminar: Endocrinology, Peripheral nerve, Membrane potential, Action potential, Synaptic transmission
15. Student report (test)
16. Experiments on muscles
17. Experiments on muscles
18. Experiments on muscles
19. Electromyography, Examination of fatigue
20. Electromyography, Examination of fatigue
21. Electromyography, Examination of fatigue
22. Examination of reflexes
23. Examination of reflexes
24. Examination of reflexes
25. Central nervous system
26. Central nervous system
27. Central nervous system
28. Seminar: Muscle and reflexes
29. Seminar: Muscle and reflexes
30. Student report (test)
31. Sensory organs I.
32. Sensory organs I.
33. Sensory organs I.
34. Sensory organs II.
35. Sensory organs II.
36. Sensory organs II.
37. Electroencephalography in humans
38. Electroencephalography in humans
39. Electroencephalography in humans
40. Student lab
41. Student lab
42. Student lab

Seminars

Exam topics/questions

Topics of questions for the theoretical examination

1. Describe the body fluid compartments and explain the methods used for measurement of body fluid volumes
2. Describe the major plasma proteins and the other non-electrolytic constituents of blood and explain their function in the body
3. Describe the intra- and extracellular ionic components and explain their physiological functions
4. The structure, function and origin of erythrocytes
5. Characterize the various leukocytes indicating their origins and functions
6. Origin and function of blood platelets
7. The basic structure and metabolism of haemoglobin and the metabolism of iron
8. Describe the two pathways involved in the initiation of blood coagulation
9. Specific mechanism of clot formation
10. Describe the mechanism of fibrinolysis. Explain the significance of anticlotting mechanism
11. Regulation of H+ ion concentration in the blood
12. A-B-0 blood groups. The Rh blood types
13. The role of leukocytes in the defence mechanism
14. Mechanical activity of the heart and the three-component model of heart muscle. Calcium ion movements within the cardiac muscle cell
15. Generators and conductors of impulses in the heart. Refractory periods
16. The sequence of events in the cardiac cycle
17. The human electrocardiogram (ECG). Electrocardiography: bipolar and unipolar leads
18. The heart sounds. Phonocardiography (PCG)
19. Cardiac output: measurement, normal standards and physiological variations
20. Metabolism and energetics of cardiac muscle
21. Ventricular wall tension and the Laplace relationship
22. The heart-lung preparation (Starling's laws)
23. Arterial blood pressure: determinants of normal arterial blood pressure
24. The arterial and the venous pulse. Basic principles of hemodynamics.
25. Circulation through the capillaries

26. The properties, production and the movement of lymph
27. Circulation in the vein. Effect of gravity on circulation
28. The pulmonary circulation. Control of lung vessels
29. The coronary circulation
30. Cerebral circulation. The concept of 'blood-brain barrier'
31. Splanchnic circulation
32. Skeletal muscle circulation. Cutaneous circulation
33. Nervous control of the heart
34. Control mechanisms of the circulatory system: general considerations
35. Local control of the vascular smooth muscle
36. Autoregulation of blood flow in tissues and organs
37. The function and importance of baroreceptors in the regulation of circulation
38. Reflex control mechanisms of circulation
39. Mechanisms of vasoconstriction and vasodilatation
40. Mechanics of respiration (functions of respiratory muscles, compliance, intrathoracic pressures, respiratory volumes)
41. Alveolar air, alveolar ventilation, dead spaces. Function of the respiratory passageways
42. Gaseous exchange in the lungs and tissues
43. O2 and CO2 transport in the body
44. Peripheral and central regulatory mechanisms of respiration. Respiratory reflexes
45. Chemical control of respiration. Acidosis, alkalosis
46. Different types of hypoxia. Oxygen treatment. Mechanisms of acclimatisation. Nitrogen narcosis. Decompression sickness
47. Describe the origin, composition, function and control of salivary secretion
48. Describe the origin, nature and function of gastric secretion indicating the mechanisms of regulation
49. Mechanism and regulation of gastrointestinal movements
50. Identify the pancreatic secretions, their components, their action and the substrates on which they act. Control mechanism of pancreatic secretion
51. Describe the basic ingredients and functions of the bile indicating the origin and fate of the components and the factors controlling bile secretions and gall bladder functions
52. Identify the components and functions of the intestinal system
53. Describe how carbohydrate is digested and absorbed indicating the enzymes involved
54. Describe how fat is digested and absorbed indicating the enzymes and secretions involved
55. Describe how protein is digested and absorbed indicating the enzymes and secretions involved
56. Dynamics of glomerular filtration. Glomerular filtration rate. Plasma clearance
57. Renal blood flow. Clearance of PAH. Extraction ratio. Filtration fraction
58. Regulation of renal blood flow and pressure. Renin-angiotensin system
59. Reabsorption and secretion of different substances in the renal tubule. Methods for their investigation
60. Concentrating and diluting mechanisms of the kidney
61. Fluid volume regulation of the body
62. Regulation of concentrations of ions in the extracellular fluid. Regulation of osmolality of body fluids
63. Basal metabolic rate. Describe factors influencing the basal metabolism
64. Define metabolic rate explaining those factors influencing the total expenditure of energy by the body
65. Describe the necessary elements of normal diet
66. The normal body temperature and its physiological variations. Hyperthermia, fever, hypothermia
67. Chemical regulation of body temperature, changes of regulation at low and high environmental temperature
68. Physical regulation of body temperature, changes of regulation at low and high environmental temperature
69. Central regulatory mechanisms of heat production and heat loss
70. Mechanisms of hormone action (receptors, intracellular mediators, cAMP, Ca2+ and diacylglycerol, protein kinases)
71. Mechanism of hormonal regulation. Negative and positive feedback controls in the endocrine system
72. The anterior pituitary hormones. Regulation of pituitary hormone secretions. Pituitary dysfunction
73. Function of growth hormone during development and after adolescence
74. Abnormalities of thyroid secretion. Goitrogens
75. Function of the thyroid gland. Iodine metabolism in the body
76. Hormonal changes during menstrual cycle
77. Hormonal changes during pregnancy. Role of placenta in pregnancy. Foeto-placental unit
78. Hormones of lactation
79. Mechanism of erection and ejaculation. The sexual act (coitus)
80. The function of testis, epididymis, seminal vesicle and prostate
81. Regulation of the sexual behaviour. Maternal behaviour
82. Physiological changes at puberty and climacteric

83. Vasopressin and oxytocin. Function of ANH (atrionatriuretic hormone)
84. The effects of prostaglandins
85. The endocrine pancreas
86. Function of insulin in the body. Diabetes mellitus
87. Hormonal control of carbohydrate metabolism
88. Hormonal control of calcium and phosphor homeostasis
89. Hormonal function of the adrenocortical system. Hypophyseal regulation of the adrenocortical system. Stress and the adaptation syndrome
90. Function and regulation of mineralocorticoids
91. Function and regulation of glucocorticoids
92. Consequences of hypo- and hyperfunction of the adrenal cortex. Androgens and oestrogens of the adrenal cortex.
93. Hormones of the adrenal medulla. Importance of the sympathoadrenal system
94. Physiology of ontogenesis and ageing.
95. Molecular mechanism of muscle contraction. The regulatory role of calcium ion
96. Mechanical characteristics of muscle. Differentiation of fast and slow twitch muscle fibres. Role of the connective tissue in the function of muscles
97. Mechanism of fatigue
98. Electromyography (EMG)
99. The source of energy for muscle contraction (aerobe and anaerobe processes). Heat production during contraction-relaxation cycle
100. The neuromuscular junction
101. Structural and functional differences between skeletal and smooth muscles. Mechanism of smooth muscle contraction
102. Membrane potential and action potential: explain their ionic mechanisms. Membrane properties of CNS neurons
103. The compound action potential. Conductive properties of various nerve fibres
104. Neurochemistry of synapses, neurotransmitters, postsynaptic receptors and neuromodulators. EPSP, IPSP
105. The myotatic (stretch) reflex. Gamma motoneurons
106. The motor units. Central control of muscle contractions
107. Types of mechanoreceptors and their role in motor control
108. How do cutaneous mechanoreceptors help to explore, learn and know our environment?
109. Somatosensory mechanisms of spinal cord and brain stem
110. Pain mechanisms, central and peripheral components
111. Descendent control (gating) of nociception and of pain reactions
112. Organisation of primary somatosensory cortex, thalamocortical projection and somatotopy
113. The human electroencephalogram (EEG). Evoked potential (EP) technique
114. Neural mechanisms of sleep and correlated somatic, autonomic and bioelectrical phenomena. The role of reticular formation in the sleep-wakefulness cycle
115. The diencephalon (hypothalamus), its motor, autonomic and hormonal regulatory function
116. Hunger and thirst. Central regulatory processes of food and water intake
117. Central mechanisms of locomotion
118. Decerebration rigidity and spinal shock (symptoms and mechanisms)
119. Postural and righting reflexes, their central mechanisms and localisation within the spinal cord, brain stem and neocortex
120. Structure and function of the extrapyramidal system
121. Symptoms after damages of different extrapyramidal structures. Role of neurotransmitters in the extrapyramidal functions
122. Importance of the cerebellum in co-ordination of movements
123. Cerebellar cortical mechanisms
124. Structure and function of the vestibular system
125. Functions of the autonomic nervous system. Autonomic reflexes
126. Humoral mediators in the autonomic nervous system. Adrenergic, cholinergic and opioid receptors
127. Structures, connections and functions of the limbic system
128. Functions of the motor cortex. Symptoms following its damage
129. Corticospinal (pyramidal) system. Consequences of lesions of the pyramidal pathways and the peripheral motoneuron
130. The concept of drive and motivation. Their integrated neural mechanisms. Reticular activating system
131. Emotions and their central nervous mechanisms
132. The phenomena of operant (instrumental) and classical (Pavlovian) conditioning. Mechanism of reinforcement
133. Electrical and chemical self-stimulation. Rewarding (positive) and punishing (negative) reinforcement. Simple learning processes. Exceptional forms of conditioning
134. Types and disorders of memory functions
135. Cerebral dominance. Lateralisation of functions in the hemispheres. Split-brain examinations
136. Functions of the parietal and temporal association (intrinsic) areas of the neocortex. Symptoms after damages (apraxia, agnosia)

137. Neurophysiological mechanisms of speech. Speech disorders
138. Functions of the frontal lobe (prefrontal intrinsic area)
139. Functions of the temporal lobe (Kluver-Bucy syndrome)
140. Central monoaminergic systems and their functional significance
141. Peripheral auditory mechanisms (conductive apparatus and cochlea)
142. Central auditory pathways, acoustic cortex and related mechanisms
143. Physiological optics
144. The retina. Photoreceptors and neuronal functions in the retina
145. Central visual pathways, the visual cortex and their functions
146. Colour vision. Stereoscopic vision
147. Peripheral and central mechanisms of olfaction
148. Peripheral and central mechanisms of sensation of taste
149. Plasticity in the nervous system. Consequences of sensory deprivation in the visual cortex. Ageing. Transplantation

Topics of questions for the student lab examination

1. Determine the bleeding time, clotting time and the prothrombin time (prothrombin-index)
2. Determination of protein content of serum
3. Describe the principle and the technique of the packed cell volume (haematocrit) determination
4. Determine the specific gravity of the blood (according to Hammerschlag). Determine the specific gravity of the blood and the blood plasma (according to Phillips-Van Slyke)
5. Determination of osmotic resistance of red blood cells
6. How do you determine the erythrocyte sedimentation rate of a blood sample?
7. How do you determine the haemoglobin content of the blood? Spectroscopic examination of gas-compounds of haemoglobin
8. How do you determine the red blood cell count?
9. How do you determine the white blood cell count?
10. Determine the diameter and volume of red blood cells. Mean haemoglobin content (MCH) and haemoglobin concentration (MCHC) of erythrocytes
11. How do you make a blood film? Describe the morphological and staining characteristics of the different white blood cell types. Give the differential leukocyte count
12. How do you determine the reticulocyte count? How do you determine the platelet count?
13. How do you perform A, B, 0 and AB blood grouping?
14. How do you perform Rh blood grouping?
15. Electric and thermal stimulation of the heart. Demonstration of extrasystole
16. Experiments on the excitatory and conductive system of the heart (ligatures of Stannius). Demonstration of the 'all or nothing' law. Summation
17. Electrocardiogram. Recording of ECG
18. Heart sounds (phonocardiogram)
19. Effects of vagal and sympathetic stimulation on the heart. Goltz reflex
20. Experiments on isolated frog's heart by means of Straub cannula. Effects of different ions on isolated heart. Examination of effects of acetylcholine and adrenaline
21. Demonstration of neurotransmission on frog's heart after Loewi
22. Study of peripheral circulation in frog's blood vessels (examination of frog's tongue; experiment of Laewen and Trendelenburg)
23. Examination of the arterial pulse. Index of physical condition
24. Methods for measuring blood pressure in humans
25. Direct measurement of blood pressure in animal experiment
26. Thoracic percussion and auscultation
27. Spirometry. Volumes and capacities of the lungs. Vital capacity
28. Determination of respiration pressure. Donders model
29. Effects of respiration on the filling of the heart (experiments of Müller and Valsalva)
30. Examination of saliva
31. Determination of gastric acid secretion (BAO, MAO, PAO)
32. Determination of lactic acid and pepsin
33. Examination of the exocrine pancreas. Amylase determination in the serum and urine
34. Examination of bile. Determination of bile pigments
35. Examination of faeces
36. How do you perform a routine urinary screening?
37. How do you determine the specific gravity of urine?
38. Examination of protein, glucose and ketone bodies in the urine

39. Determination of haemoglobin, bilirubin and urobilinogen in the urine
40. How do you examine urine sediment?
41. Determination of basal metabolic rate. Measurement of oxygen consumption in rat
42. Examination of oestrus cycle in rat
43. Different tests of pregnancy
44. Determination of human blood glucose level. Experimental manipulation of blood glucose level in the rabbit
45. Effects of chemical stimuli on striated muscle
46. Direct and indirect stimulation of nerve-muscle preparation. Effect of curare
47. Recording of a twitch contraction. Superposition. Effects of repetitive stimulation on muscles (complete and incomplete tetanus)
48. Effect of load on muscular contraction. Examination of fatigue in nerve-muscle preparation. Finger ergograph after Mosso
49. Electromyographic registration methods (surface and deep electrodes). Taking an EMG
50. Measurement of conduction velocity of peripheral nerve trunks. Recording of a compound action potential from a nerve
51. Demonstration of the Pflüger's law
52. Chronaxia and rheobase. Electrical stimulation of nerves and muscles in man
53. Examination of reflexes in frog. The law of Bell and Magendie
54. Examination of reflexes in the human
55. Stereotaxic technique
56. Reflex time, reaction time and action time
57. Electroencephalogram (EEG). Taking an EEG
58. Measurement of visual acuity. Refractive errors and their corrections
59. Examination of visual accommodation
60. Measurement of astigmia
61. Examination of pupillary reflex
62. Ophthalmoscopy
63. Perimetry
64. Examination of colour weakness and colour blindness
65. Examination of afterimages, colour-mixing and contrast effects
66. Laryngoscopy and otoscopy
67. Electronic audiometry
68. Tuning fork tests in human audiometry
69. Examination of the taste and olfactory senses

OSAFI1 DENTAL CLINICAL INFORMATICS 1

Course director: **DR. FERENC KILÁR**, professor
Institute of Bioanalysis

2 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **14 lectures + 14 practices + 0 seminars = total of 28 hours**

Headcount limitations (min-max.): **1 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

Practicing basic computing and data-handling skills which are necessary in your future job.

The most widely used application and clinical software.

Conditions for acceptance of the semester

Two written test, no more than two missed classes.

There is a three-step-exam for the grade: an entry-test, a problem to be solved by the computer (using SPSS) and a theory question. All the three should be completed at least 'satisfactory' for a succesfull exam.

Making up for missed classes

One extra class.

Reading material

L. Pótó: Biometrics - workbook, PTE ÁOK, 2007.

Moore, D. S. The Basic Practice of Statistics, 5th Ed., 2010. W.H. Freeman

Lectures

1. Hardware basics, operating systems, the main fields of computer (PC-) application.
2. Wordprocessing
3. Wordprocessing
4. Wordprocessing
5. Wordprocessing
6. Datahandling by the PC
7. Datahandling by the PC
8. Datahandling by the PC
9. Datahandling by the PC
10. Datahandling by the PC
11. Datahandling by the PC
12. Datahandling by the PC
13. Datahandling by the PC
14. Datahandling by the PC

Practices

1. Using Windows XP, The main application sotfware categories
2. Using Word - the basics. Entering and editing text.
3. Formatting characters and paragraphs.
4. Tables.
5. Using styles. Pagination and Contents page.
6. Types of data, enter and coding data. The SPSS software. Overviewing your data - the histogram.
7. Descriptive statistics - the mean and the standard deviation.
8. Distributions. The normal distribution.
9. The distribution of the sample mean. The Cinfidence Interval for the exected value.
10. The basic scheme of hypothesis testing. The one sample and the paired samples t tests.
11. The independent samples t test.
12. Connection between two continuous variables. The linear regression and correlation.
13. Frequencies and contingency tables. Connection between two categorical variables. The chi-squared test.
14. Excercises. The way ahead: Nonparametric tests, ANOVA.

Seminars

Exam topics/questions

Theory questions:

1. The main goal of biostatistics? data collection and data evaluation in medicine.

2. The key feature of the statistical thinking ? the probability

3. The idea of the probability distribution ? discrete distributions
4. The basic principles of statistical thinking ? from the data to the decision
5. Types of the data (variables) and displaying them with graphs
6. The population and the sample
7. Numerical description of continuous data
8. The idea of the probability distribution ? continuous distributions
9. The normal distribution
10. Statistical inference
11. The confidence interval of the population mean
12. The basic idea of hypothesis testing
13. The one sample and the paired t test
14. The confidence interval and the hypothesis testing
15. The risk of errors and the power of a test
16. The two (independent) samples t test
17. Connection between two variables ? continuous variables
18. Connection between two variables ? categorical variables
19. Evaluation of frequency data
20. Nonparametric tests
21. The principle of the ANOVA

Data handling skill:
Solving a data evaluation problem by the SPSS.

OSAIMM BASIC IMMUNOLOGY

Course director: **DR. PÉTER NÉMETH**, professor
Department of Immunology and Biotechnology

4 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **28 lectures + 28 practices + 0 seminars = total of 56 hours**

Headcount limitations (min-max.): **5 – 200**

Prerequisites: **see in the recommended curricula!**

Topic

Introduction to the current immunobiology. Construction of the human immune system: organs, tissues, cellular and molecular components. Organisation and regulation of immune functions: recognitin, differentiation, effector functions and memory formation. Main aspects of the physiological and pathological immune functions. Basic immunopathological aspects of immune related diseases including autoimmune diseases, organ transplantation, allergy, immunity against tumors.

Conditions for acceptance of the semester

Prepared attendance on lectures and practices. No more abscence as 3 in practices.

Making up for missed classes

Practice performed with another group on the same week.

Reading material

Lectures

1. Introduction, historical overview, main aspects and perspectives in the theoretical and pactical immunology - immunobiology
2. Composition of the immune system: developmental properties of its organs, tissues and cells
3. Molecular components of the immunological recognition: Antibodies and B cell receptors
4. MHC and their classes, structure and functions
5. Recognition of antigen by T cells . Antigen presentation and MHC restriction
6. Role of co-receptors and adhesion molecules
7. Primary lymphocyte maturation. Expression of antigen receptor genes
8. Primary B cell development: maturation stages and environmental regulators
9. T-cell development in the thymus. Stages of maturation and the role of environmental factors
10. Innate immunity: inflammation, leukocyte migration
11. Complement system
12. Cytokines and their role in immune regulation
13. The central phase of the immune response: cellular interactions, T-B cell cooperation, antibody production. Signal transduction following Ag-recognition
14. The central phase of the immune response: cellular interactions, T-B cell cooperation, antibody production.
15. The role of adhesion molecules and cytokines in the Th1-Th2 differentiation and isotype expression.
16. Maintenance of the immunological memory and its role in immune response regulation. Comparison of the primary and secondary immune response.
17. Cell mediated immunity (CMI): Cytotoxicity (NK cells, cytotoxic T cells) TH cell mediated macrophage activation (delayed type hypersensitivity = DTH.)
18. Cell mediated immunity (CMI) II
19. Regulation of the effector functions: Immunoglobulin mediated immune reactions. Fc receptors.
20. Suppression of immune response. Role of the antigen, antigen presenting cells, T and B lymphocytes. Immunoglobulin-immunoglobulin interactions, idiotype network.
21. Systemic and local immunity: Mucosa and skin associated immune system
22. Immunological tolerance: Cellular and molecular mechanisms of the immunological tolerance
23. Miss-regulation of immune system: development of organ-specific and systemic autoimmune diseases
24. Hypersensitivity reactions
25. Cellular and molecular mechanism of allergies. T cell mediated macrophage activation, delayed type hypersensitivity (DTH)
26. Immunity against tumors
27. Immunological aspects of organ transplantation
28. Acquired and heredited immunodefficiencies

Practices

1. Main cellular and molecular components of the immune system (seminar)
2. Main cellular and molecular components of the immune system (seminar)
3. Development and composition of the lymphoid system. Microscopic structure of the lymphoid tissues.
4. Development and composition of the lymphoid system. Microscopic structure of the lymphoid tissues.

5. Immunisation techniques. Antibody (polyclonal and monoclonal) production, purification, labelling. Hybridoma technology, fermentation.
6. Immunisation techniques. Antibody (polyclonal and monoclonal) production, purification, labelling. Hybridoma technology, fermentation.
7. Main aspects of immunocytochemistry. Intracellular immunoglobulin detection by immunoperoxidase technique
8. Main aspects of immunocytochemistry. Intracellular immunoglobulin detection by immunoperoxidase technique
9. Preparation of white blood cells from the peripheral whole blood. ?Ficoll gradient? centrifugation.
10. Flow cytometry. Determination of different CD markers on human peripheral blood cells
11. Consultation
12. Consultation
13. Immunoserology I. ELISA, dot-blot, Western blot.
14. Immunoserology I. ELISA, dot-blot, Western blot.
15. Immunoserology II.Immunprecipitation, immunodiffusion techniques (Manchini, Ouchterlony),immunoelectrophoresis. Haemagglutination techniques, Coombs test.
16. Immunoserology II.Immunprecipitation, immunodiffusion techniques (Manchini, Ouchterlony),immunoelectrophoresis. Haemagglutination techniques, Coombs test.
17. Short-term and long-term cell cultures. In vitro functional tests of phagocytes, cytotoxic cells
18. Short-term and long-term cell cultures. In vitro functional tests of phagocytes, cytotoxic cells
19. Immune response against pathogens (seminar)
20. Immune response against pathogens (seminar)
21. Types of vaccines and modes of their action. (Slides)
22. Types of vaccines and modes of their action. (Slides)
23. Possible targets in immuntherapies. Monoclonal antibody therapy. (Slides)
24. Possible targets in immuntherapies. Monoclonal antibody therapy. (Slides)
25. Autoantibody detection, tissue typing, determination of the HLA.
26. Autoantibody detection, tissue typing, determination of the HLA.
27. Consultation
28. Consultation

Seminars

Exam topics/questions

See on web site www.immbio.hu

OSANAN NEUROANATOMY, HISTOLOGY AND EMBRYOLOGY

Course director: **DR. PÁL TÓTH**, associate professor
Department of Anatomy

7 credit ▪ final exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **28 lectures + 70 practices + 0 seminars = total of 98 hours**

Headcount limitations (min-max.): **5 – 100**

Prerequisites: **see in the recommended curricula!**

Topic

Macroscopic and microscopic anatomy, and development of the central nervous system. Morphological basis of neuroendocrine integration. Regional anatomy of the head and the neck with special emphasis.

The structure of the central nervous system including functional and developmental aspects. Regions of the head and neck, organs innervated by cranial nerves particularly empasized. Structure and development of the endocrine and sensory organs. The course is to give basic morphological knowledge to further clinical studies, including neurology, neurosurgery, ophthalmology, especially craniofacial surgery, etc.

Conditions for acceptance of the semester

Students must make proper records with drawings in the classes. Acceptance of the records by the instructor of the group is a prerequisite for getting the signature at the end of the semester.

Presence on at least 85% of the lectures and practices. Absences (with any reason) should not exceed 14 hours (14x45 min = e.g. 7 weekly practices, or 6 practices and 2 lectures, etc.).

Making up for missed classes

Exceptionally, students may attend the practice of another group (strictly on the same week).

Reading material

http://an-server.pote.hu

Lectures

1. The integumentary system.
2. Circulation of the cerebrospinal fluid, blood supply of the brain, meninges: clinical implications.
3. Autonomous nervous system 2.
4. Autonomous nervous system 1.
5. The somato-sensory systems.
6. The bony and membranous labyrinth and their development.
7. The tympanic cavity, its contents and their development.
8. The retina.
9. The eye 2 and its development.
10. The eye 1.
11. Endocrine organs 2.
12. Endocrine organs 1.
13. The hypothalamus and the hypothalamo-hypophyseal system.
14. Connections and functions of the cerebellum.
15. The general structure of the cerebellar cortex.
16. Anatomical bases of brainstem reflexes.
17. Nuclei of the cranial nerves.
18. The overall structure of the rhombencephalon and the mesencephalon.
19. Descending pathways of the spinal cord.
20. Ascending pathways of the spinal cord.
21. Spinal reflexes.
22. Microscopic organisation of the spinal cord.
23. Blood supply and meninges of the spinal cord, clinal aspects.
24. Basic neurohistology. The glia.
25. Basic neurohistology. Axon terminals 2. Receptors and effectors.
26. Basic neurohistology. The neuron 2.
27. Basic neurohistology. The neuron 1.
28. Basic neurohistology. Axon terminals 1. Synapses.

Practices

1. Histology: Recapitulation, preparation for the exam.
2. Histology: Recapitulation, preparation for the exam.
3. Dissecting room: Recapitulation, preparation for the exam.
4. Dissecting room: Recapitulation, preparation for the exam.
5. Histology: The inner ear.

6. Histology: The inner ear.
7. Dissecting room: X-ray and CT pictures of the brain and brain vessels.
8. Dissecting room: X-ray and CT pictures of the brain and brain vessels.
9. Dissecting room: The para- and retropharyngeal spaces (recapitulatuion).
10. Dissecting room: The para- and retropharyngeal spaces (recapitulatuion).
11. Histology: The eye.
12. Histology: The eye.
13. Dissecting room: The pharynx (recapitulatuion).
14. Dissecting room: The pharynx (recapitulatuion).
15. Histology: The visual and acoustic pathways. The development of the eye and the ear. (seminar)
16. Histology: The visual and acoustic pathways. The development of the eye and the ear. (seminar)
17. Dissecting room: The oral cavity (recapitulatuion).
18. Dissecting room: The oral cavity (recapitulatuion).
19. Dissecting room: The oral cavity (recapitulatuion).
20. Dissecting room: The oral cavity (recapitulatuion).
21. Histology: Histology of the endocrine organs.
22. Histology: Histology of the endocrine organs.
23. Dissecting room: The nasal cavity (recapitulatuion).
24. Dissecting room: The nasal cavity (recapitulatuion).
25. Histology: The cerebral cortex and basal ganglia (seminar).
26. Histology: The cerebral cortex and basal ganglia (seminar).
27. Dissecting room: Regions of the head and neck.
28. Dissecting room: Regions of the head and neck.
29. Dissecting room: Regions of the head and neck.
30. Dissecting room: Regions of the head and neck.
31. Histology: The diencephalon (seminar).
32. Histology: The diencephalon (seminar).
33. Dissecting room: Regions of the head and neck.
34. Dissecting room: Regions of the head and neck.
35. Histology: The cerebellum (seminar).
36. Histology: The cerebellum (seminar).
37. Dissecting room: Regions of the head and neck.
38. Dissecting room: Regions of the head and neck.
39. Dissecting room: Regions of the head and neck.
40. Dissecting room: Regions of the head and neck.
41. Histology: The spinal pathways and the brainstem (seminar).
42. Histology: The spinal pathways and the brainstem (seminar).
43. Dissecting room: Regions of the head and neck.
44. Dissecting room: Regions of the head and neck.
45. Histology: Histology of the spinal cord. Spinal reflexes.
46. Histology: Histology of the spinal cord. Spinal reflexes.
47. Dissecting room: The spinal cord.
48. Dissecting room: The spinal cord.
49. Dissecting room: Demonstration of brain slices.
50. Dissecting room: Demonstration of brain slices.
51. Histology: Nerve terminals, glia.
52. Histology: Nerve terminals, glia.
53. Dissecting room: Dissection of the brain.
54. Dissecting room: Dissection of the brain.
55. Histology: Neurons, peripherial nerves.
56. Histology: Neurons, peripherial nerves.
57. Dissecting room: Dissection of the brain.
58. Dissecting room: Dissection of the brain.
59. Dissecting room: Dissection of the brain.
60. Dissecting room: Dissection of the brain.
61. Histology: The integumentary system.
62. Histology: The integumentary system.
63. Dissecting room: Dissection of the brain.
64. Dissecting room: Dissection of the brain.

65. Histology: The skull.
66. Histology: The skull.
67. Dissecting room: The skull.
68. Dissecting room: The skull.
69. Dissecting room: The skull.
70. Dissecting room: The skull.

Seminars

Exam topics/questions
http://an-server.pote.hu

OSAORB ORAL BIOLOGY

Course director: **DR. KÁROLY ÁKOS NAGY**, assistant professor
Dept. of Dentistry, Oral-, Maxillofacial Surgery

3 credit ▪ semester exam ▪ Basic module ▪ spring semester ▪ recommended semester: 4

Number of hours/semester: **14 lectures + 28 practices + 0 seminars = total of 42 hours**

Headcount limitations (min-max.): **2 – 0**

Prerequisites: **see in the recommended curricula!**

Topic

During this semester the student gets knowledge about the oral structures and these developments, functions and about the biochemical, moleculear biological, histological processes of bone and oral environment.

Conditions for acceptance of the semester

Attending the classes, according to the rules of the Code of Studies and Examinations.

Oral exam.

A score system is used for the acceptance of practices.

The score system is demonstrated on the first practice.

Making up for missed classes

Not possile.

Reading material

Lectures

1. Developement of teeth
2. Process of mineralization
3. Osteogenesis - tissue structure, metabolism. Process of bone resorption.
4. Amelogenesis - tissue structure
5. Dentinogenesis - secundary, terciery dentin formation
6. Cementogenesis. Histology and function of parodontal ligaments
7. Crystal-structure of bioapatites. Fluoride metabolism. Effect of fluorides on tooth structure
8. Eruption of teeth. Movement of teeth
9. Developement and structure of pulp
10. Oral sensation. Pain. Decreasing of stimulus-threshold. Sense of taste. Smelling
11. Ionizing radiation. Radio-Osseo-Necrosis
12. Effect of diet on oral tissues. Effect of age. Systematic diseases, medicines in dental practice
13. Structure of oral soft tissues. Gingival sulcus
14. Anatomy of temporo-mandibular joint. Pathways of articulation. Mastication, swallow

Practices

1. Tooth formation by wax carving
2. Tooth formation by wax carving
3. Tooth formation by wax carving
4. Tooth formation by wax carving
5. Tooth formation by wax carving
6. Tooth formation by wax carving
7. Tooth formation by wax carving
8. Saliva - production and physiology
9. Role of saliva proteins and peptides in caries developement and protection
10. Bone regeneration. Osteoplasty, PRP
11. Specific and non specific oral defense
12. Oral microorganisms. Plaque, like a biofilm. Biochemistry of plaque
13. Dental implants. Molecular biological and biochemical background
14. Basic research methods and application of results in dental practice
15. Tooth formation by wax carving
16. Tooth formation by wax carving
17. Tooth formation by wax carving
18. Tooth formation by wax carving
19. Tooth formation by wax carving
20. Tooth formation by wax carving
21. Tooth recognition - midterm report

22. Saliva - production and physiology
23. Role of saliva proteins and peptides in caries developement and protection
24. Bone regeneration. Osteoplasty, PRP
25. Specific and non specific oral defense
26. Oral microorganisms. Plaque, like a biofilm. Biochemistry of plaque
27. Dental implants. Molecular biological and biochemical background
28. Basic research methods and application of results in dental practice

Seminars

Exam topics/questions

1. Developement of teeth
2. Process of mineralization
3. Osteogenesis
4. Process of bone resorption.
5. Amelogenesis
6. Dentinogenesis
7. Cementogenesis.
8. Histology and function of parodontal ligaments.
9. Crystal-structure of bioapatites.
10. Fluoride metabolism. Effect of fluorides on tooth structure.
11. Eruption of teeth. Movement of teeth.
12. Developement and structure of pulp.
13. Oral sensation. Pain. Decreasing of stimulus-threshold.
14. Sense of taste. Smelling.
15. Ionizing radiation. Radio-Osseo-Necrosis.
16. Effect of diet on oral tissues. Effect of age.
17. Systematic diseases, medicines in dental practice.
18. Structure of oral soft tissues. Gingival sulcus.
19. Anatomy of temporo-mandibular joint.
20. Pathways of articulation. Mastication, swallow.
21. Saliva - production and physiology.
22. Role of saliva proteins and peptides in caries developement and protection.
23. Bone regeneration.
24. Osteoplasty, PRP
25. Specific and aspecific oral protection.
26. Oral microorganisms.
27. Plaque, like a biofilm. Biochemistry of plaque.
28. Dental implants. Molecular biological and biochemical background.
29. Basic research methods and application of results in dental practice.