Faculty of Pharmacy
GENERAL INFORMATION REGARDING THE CREDIT SYSTEM
AT THE FACULTY OF PHARMACY

In the academic year 2007/2008 credit system applies to all pharmacy students.

I. STRUCTURE OF STUDIES

Students should acquire **300 credits** in order to obtain the Master of Pharmacy degree. Credits have to be collected according to the following scheme:

- Compulsory subjects: 240 credits
- Compulsory elective subjects: 44 credits
- Elective subjects: 16 credits

Students have to obtain min. 80 credits until the end of the fourth semester.

II. EXPRESSIONS

**Compulsory subject**: It is obligatory to take all compulsory subjects during your studies.

**Compulsory elective subject**: It is compulsory to choose from the courses offered in order to gain 44 credits according to the following:

- Subjects of the ninth semester: one has to acquire min. 12 credits
- Students have to submit a thesis in the tenth semester (10 credits)
- 24 weeks of compulsory pharmacy practice including 4 weeks of hospital practice (22 credits)

**Contact hours**: Are the units of time required for a teacher to present subject material and to assess a student’s performance. Contact hours include lectures, seminars, practical demonstrations, consultation hours and assessment.

**Credit**: Credits are standard measurement of a student’s accepted study time. One credit equals thirty hours of study time.

**Credit transfer**: Is a procedure accorded by the University of Szeged Code of Study and Examination Regulations whereby a partial or full exemption can be given from completing one or more subjects by acknowledging previously completed subjects and thereby award the appropriate number of credit points.

**Criteria subject**: Completion of criteria subjects is a precondition for receiving the diploma after finishing the fifth year. Criteria subjects have no credits allocated to. Criteria subjects are Physical Training (4 semesters) and summer practices.

**Course requirement**: Certain subjects (courses) can only be taken if the subject requirement has been met. This means that the precondition for attending the course is the successful completion of the subject defined in the course requirement.

The precondition of acceptance of a certain subject is the parallel completion of both the theoretical and practical part.

**Elective subject**: One can choose from the subjects given in order to get 16 credits during the studies.

**Suggested study plan**: the order and timing of subjects offered to students enabling them to obtain qualification within a specified period of time.
III. RULES AND REGULATIONS

1. Confirmation about having completed the study requirements in a certain subject is given by the Department concerned by signing the index book. In order to participate in an examination the student has to present the index book at the place of the examination before starting the exam.

2. Precondition for receiving the index book for the exam period is not to have any debts (tuition fee □ matriculation □ valid health insurance □ visa/residence permit). Contact your group leader to find out whether you have any debts.

3. Students have three chances to sit for an examination (a fourth chance can be granted only in one subject if that is the only examination left).

4. If you failed an examination □ you can repeat it provided you pay a repeat examination fee. After collecting the repeat exam cheque from the Foreign Students’ Secretariat □ you have to pay the fee at the post office and return the slip to get your repeat ticket. The repeat tickets have to be presented at the Department concerned before starting the examination. One is not allowed to repeat an exam within 3 days after the failed examination. (fees: pg 24)

5. Students have to sign up for the exams in the ETR system. The exam registration is automatically closed 24 hours before the examination. Please check the registration period of your exam when you are signing up for it □ because in some departments exam registrations are closed down on Friday. (You can check it by clicking on the course code of the course in the “Exam Registration” section).

6. Signing up for an examination and not attending it □ results in losing one examination chance. The date of the absence has to be registered in the index book by the Foreign Students’ Secretariat.

7. If you would like to postpone an examination □ you can do so in the ETR system 24 hours before the day of the examination concerned.

**Matriculation:** You are required to MATRICULATE for each semester. In case a student is not matriculated he/she is not entitled to attend classes (the course registration will not be closed □ in that case the student’s name will not appear on the departments’ list).

**Matriculation requirements:**
- Paying the tuition fee
- Filling in the matriculation form
- Signing the Student Payment Agreement
- Submitting a copy of your valid visa / residence permit
- Submitting a copy of your valid health insurance
- Submitting your summer practice (if required)
- Submitting your index book (with all signatures and grades)
- Course registration in ETR

**Tuition fee:** Payment can be made the following ways:
- by transfer
- by cash: you have to pick up a slip at the Foreign Students' Secretariat in order to be able to pay in cash at the bank.
- by cheque: the cheques have to be handed in at the Foreign Students' Secretariat.

Payments have to be made to the following account:

**Hungarian Foreign Trade Bank (MKB), Szeged, Kölcsey u. 3**
Swift code: MKKBHUHB
IBAN: HU14-1030-0002-6610-3177-2700-4013

Note that the transfer fee (bank charge) has to be paid by the student. Make sure that the exact amount of your tuition fee is credited to the University’s account. Bank charges are especially high if the transfer is made through more than two banks.

**Obligation to report changes to the Secretariat:** If there is a change in your personal data (address □ telephone number etc.) □ you are required to notify the Secretariat. If you have to leave Szeged for a longer period of time during the lecture period due to substantial reasons □ you need to request permission in writing. Applications have to be handed in at the Foreign Students’ Secretariat.

*If there is any change in your e-mail address, mobile number or address in Szeged, please correct them in the ETR. Note that it is your responsibility to keep these data up-to-date.*
**Attendance of classes:** It is compulsory to attend the lectures and practical classes. Make sure your absences do not exceed the limit which is 25% of all classes prescribed to the subject concerned in the particular semester. If the number of absences exceeds the limit students have to repeat the subject.

**Residence permit:** All students must have a valid residence permit D-5 (student) visa or registration card in order to matriculate! **Non-EU** citizens should enter the country either with a new D-5 visa or a valid residence permit! Students having a D-5 visa have to apply for residence permit at the Immigration Office latest **30 days** before the expiry of the visa. 

**EU** citizens and students from the **EEA** (e.g. Norway) don’t need a visa but they need a registration card which will be issued for them at the Immigration Office for an indefinite period. For more information contact the Immigration Office or check the Secretariat’s website. [http://www.szote.u-szeged.hu/angoltit/?q=residence](http://www.szote.u-szeged.hu/angoltit/?q=residence)

**Health Insurance:** Matriculation requirement is a valid health insurance. If one intends to contract the Providencia Insurance (24,000 HUF per semester) the policy is available at the Foreign Students’ Secretariat and on the Secretariat’s website!
### SUGGESTED STUDY PLAN

#### 2007/2008 1st year, 1st semester

#### Compulsory Subjects

<table>
<thead>
<tr>
<th>Code of Subject</th>
<th>Course</th>
<th>Department</th>
<th>Lecturer</th>
<th>Hrs/week: Theory</th>
<th>Hrs/week: Practice</th>
<th>Form of Exam</th>
<th>Credit</th>
<th>Course Requirement</th>
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<tbody>
<tr>
<td>GYTKKA041</td>
<td>Physics-Biophysics I.</td>
<td>Experimental Physics Department</td>
<td>Dr. PÉTER MAKRA associate professor</td>
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<tr>
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#### Elective Subjects

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<th>Code of Subject</th>
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<th>Department</th>
<th>Lecturer</th>
<th>Hrs/week: Theory</th>
<th>Hrs/week: Practice</th>
<th>Form of Exam</th>
<th>Credit</th>
<th>Course Requirement</th>
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<tbody>
<tr>
<td>GYTKKA001</td>
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<td>Prof. habil. GYÖRGY DOMBI professor, Head of Department</td>
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#### Criteria Subjects

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## Suggested Study Plan

### Compulsory Subjects

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<tr>
<th>Code of Subject</th>
<th>Course</th>
<th>Department</th>
<th>Lecturer</th>
<th>Hrs/week: Theory</th>
<th>Hrs/week: Practice</th>
<th>Form of Exam</th>
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<th>Course Requirement</th>
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<tbody>
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<tr>
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<td>Mathematics</td>
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<td>National Ambulance Service</td>
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<td>GTTKA532</td>
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<td>National Ambulance Service</td>
<td>Dr. Andrea Čsergős head physician</td>
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### Elective Subjects (2 subjects)

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<tr>
<th>Code of Subject</th>
<th>Course</th>
<th>Department</th>
<th>Lecturer</th>
<th>Hrs/week: Theory</th>
<th>Hrs/week: Practice</th>
<th>Form of Exam</th>
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<th>Course Requirement</th>
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<tbody>
<tr>
<td>GTTKA991</td>
<td>Radiochemistry</td>
<td>Institute of Pharmaceutical Analysis</td>
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<td>GTTKA1042</td>
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<td>Behavioural Sciences Department</td>
<td>SERFOZONE Dr. ADEL TOTH assistant professor</td>
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<td>Evaluation</td>
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<td>Short History of Hungary I.</td>
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### Total:

16 20 32
## SUGGESTED STUDY PLAN

<table>
<thead>
<tr>
<th>Code of Subject</th>
<th>Course</th>
<th>Department</th>
<th>Lecturer</th>
<th>Hrs/week: Theory</th>
<th>Hrs/week: Practice</th>
<th>Form of Exam</th>
<th>Credit</th>
<th>Course Requirement</th>
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<tbody>
<tr>
<td>GYTKKA103</td>
<td>Quantitative Chemical Analysis II.</td>
<td>Inorganic and Analytical Chemistry Dept.</td>
<td>Dr. ANTAL PÉTER professor</td>
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<td>Dr. GAJDAJÉ K. SCHRANTZ KRISZTINA assistant professor</td>
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### Compulsory Subjects

### Elective Subjects

### Criteria Subjects

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<th>Criteria Subject</th>
<th>Hrs/week Theory</th>
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**Elective Subjects**

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**PHARMACY**

2007/2008 2nd year spring, 4th semester
# SUGGESTED STUDY PLAN

## 2007/2008 3rd year fall, 5th semester

### Compulsory Subjects

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## SUGGESTED STUDY PLAN

### 2007/2008 4th year spring, 8th semester

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<tr>
<td>Code of Subject</td>
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<td>Department</td>
<td>Lecturer</td>
<td>Hrs/week: Theory</td>
<td>Hrs/week: Practice</td>
<td>Form of exam</td>
<td>Credit</td>
<td>Course Requirement</td>
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<tr>
<td>GYTKKA331</td>
<td>Fundamentals of Clinical Therapy</td>
<td>2nd Department of Internal Medicine</td>
<td>Dr. NOEMI GRUBER associate professor</td>
<td>3</td>
<td>-</td>
<td>Exam</td>
<td>4</td>
<td>Phys. II., Pathophys. II., Pharmacodyn. II.</td>
</tr>
<tr>
<td>GYTKKA251</td>
<td>Clinical Pharmacy</td>
<td>Department of Clinical Pharmacy</td>
<td>Dr. GYÖNGYVER SOÓS associate professor, Head of Department</td>
<td>2</td>
<td>-</td>
<td>Exam</td>
<td>3</td>
<td>Pathophys. II., Biopharm., Public Health II.</td>
</tr>
<tr>
<td>GYTKKA255</td>
<td>Pharmacodynamics</td>
<td>Pharmacodynamics Department</td>
<td>Prof. habil. GYÖRGY FALKAY professor, Head of Department</td>
<td>3</td>
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</tr>
<tr>
<td>GYTKKA256</td>
<td>Pharmacodynamics</td>
<td>Pharmacodynamics Department</td>
<td>Prof. habil. GYÖRGY FALKAY professor, Head of Department</td>
<td>-</td>
<td>3</td>
<td>Term Mark</td>
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<td>Pharmacodyn. II. (th., pr.)</td>
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<tr>
<td>GYTKKA351</td>
<td>Pharmaceutical Care</td>
<td>Department of Clinical Pharmacy</td>
<td>Dr. GYÖNGYVER SOÓS associate professor, Head of Department</td>
<td>-</td>
<td>3</td>
<td>Term Mark</td>
<td>2</td>
<td>Pathophys. II., Biopharm., Public Health II.</td>
</tr>
<tr>
<td>GYTKKA371</td>
<td>Natural Treatments</td>
<td>Pharmacodynamics Department</td>
<td>Prof. habil. GYÖRGY FALKAY professor, Head of Department</td>
<td>2</td>
<td>-</td>
<td>Exam</td>
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<td>Phys.-Biophys. II., Pharmacognosy II., Pathophys. II., Pharmacodyn. II.</td>
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Pharmacy Practice 1. (8 weeks) 40 hrs

<table>
<thead>
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<th>Credit</th>
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**Compulsory Elective Subjects**

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<tr>
<th>Code of Subject</th>
<th>Course</th>
<th>Department</th>
<th>Lecturer</th>
<th>Hrs/week: Theory</th>
<th>Hrs/week: Practice</th>
<th>Form of exam</th>
<th>Credit</th>
<th>Course Requirement</th>
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<tbody>
<tr>
<td>GYTKKA461</td>
<td>Ward Pharmacy (Clinical Pharmacy II)</td>
<td>Department of Clinical Pharmacy</td>
<td>Dr. GYÖNGYVER SOÓS associate professor, Head of Department</td>
<td>2</td>
<td>-</td>
<td>Exam</td>
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<td>Pathophys. II., Biopharm., Pharmacodyn. II.</td>
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<tr>
<td>GYTKKA451</td>
<td>Pharmaceutical Psychology</td>
<td>Psychiatry Department</td>
<td>Dr. TIBOR RUDISCH assistant professor</td>
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<td>-</td>
<td>Exam</td>
<td>2</td>
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<tr>
<td>GYTKKA441</td>
<td>Tropical Medicine</td>
<td>Psychiatry Department</td>
<td>Prof. habil. GABOR BALINT professor</td>
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<td>-</td>
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<td>Physiology II., Pathophys. I.</td>
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<tr>
<td>GYTKKA321</td>
<td>Veterinary Pharmacy</td>
<td>Pharmacodynamics Department</td>
<td>Prof. habil. GYÖRGY FALKAY professor, Head of Department</td>
<td>2</td>
<td>-</td>
<td>Exam</td>
<td>2</td>
<td>Biopharm.</td>
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<tr>
<td>GYTKKA421</td>
<td>Quality Assurance</td>
<td>Department of Drug Regulatory Affairs</td>
<td>Prof. TAMAS PAAL Professor, Head of Department</td>
<td>3</td>
<td>-</td>
<td>Exam</td>
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<td>Pharm. Techn. IV.</td>
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<tr>
<td>GYTKKA491</td>
<td>Human Genetics</td>
<td>Department of Medical Genetics</td>
<td>Prof. JANOS SZABO, professor, Head of Department</td>
<td>1</td>
<td>Exam</td>
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**Elective Subjects**

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<th>Course</th>
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<th>Form of exam</th>
<th>Credit</th>
<th>Course Requirement</th>
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<tr>
<td>GYTKKA361</td>
<td>Computerized Dosage Form Planning</td>
<td>Pharmaceutical Technology Department</td>
<td>Dr. GÉZA REGDON, associate professor</td>
<td>-</td>
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<td>Term Mark</td>
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<td>GYTKKA361-1</td>
<td>Everyday Dermatology</td>
<td>Department of Clinical Pharmacy</td>
<td>Dr. GYÖNGYVER SOÓS associate professor, Head of Department</td>
<td>2</td>
<td>-</td>
<td>Exam</td>
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<td>Pathophysiology</td>
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**Total:** 24 8 41
## SUGGESTED STUDY PLAN

<table>
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<th>Code of Subject</th>
<th>Course</th>
<th>Department</th>
<th>Lecturer</th>
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<th>Hrs/week: Practice</th>
<th>Form of Exam</th>
<th>Credit</th>
<th>Course Requirement</th>
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<tr>
<td></td>
<td>2007/2008 5th year, 10th semester</td>
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<td></td>
<td>Pharmacy Practice 2. (16 weeks)</td>
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<td>Term Mark 18</td>
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</table>
5th year / Spring semester

The deadline of submitting the thesis is March 31, 2008

**Pharmacy students** perform a 16 weeks clerkship (12 successive weeks in public pharmacies, 4 weeks can be accomplished in pharmacy, pharmaceutical factory, galenical laboratory, university department or hospital pharmacy).

**Fees:**

From the academic year 2005/2006 fifth year pharmacy students have to pay the whole tuition fee for the second semester of the fifth year.

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**INTERIM PRACTICE**

*2nd year pharmacy students* must perform a practice of 4 weeks in a pharmacy.

*3rd year pharmacy students* must perform a practice of 4 weeks in a pharmacy.

*4th year pharmacy students* must perform a practice of 8 weeks in a pharmacy (pharmacy, pharmaceutical factory, galenical laboratory, university department or hospital/clinical pharmacy).

*5th year pharmacy students* must perform a 16-week clerkship in the second semester of the academic year. (12 successive weeks in public pharmacies and 4 weeks in a hospital/clinical pharmacy.)
SYLLABUSES FOR 1ST YEAR PHARMACY STUDENTS

PHYSICS-BIOPHYSICS

1st semester

LECTURES

Flow of fluids

Diffusion
- Fick’s first law. General equation of continuity. Fick’s second law. One-dimensional free diffusion and its role in the gas exchange of erythrocytes. The oxygen supply of tissues

Heat transport

Transport through biological membranes
- Passive diffusion. Facilitated diffusion. Active transport

Membrane balance of neutral particles, osmosis
- Van’t Hoff’s law. The physiological significance of osmosis

Membrane potentials

The experimental basis of quantum mechanics

2nd semester

LECTURES

Optical spectroscopy
- The theoretical basis of optical spectroscopy: luminescence properties and the energy-level structure of molecules. Experimental methods of molecular spectroscopy: atom absorption, atom fluorescence, molecular absorption and molecular fluorescence spectroscopy

Lasers

X-rays
- General properties of X-rays. X-ray sources. X-ray spectra. The attenuation of X-rays in a medium. Medical applications of X-rays. Determining molecular structure with the help of X-ray diffraction

Radioactivity
- Radioactive decay law. Types of nucleus decay: α-decay, β-decay, positron decay, K-electron capture, γ-radiation

Dosimetry
- Dose units. Ionising radiation and the human being: effects of radiation, hit theories, radiation protection

Radiation meters
- The gas ionisation method: proportional counters, the Geiger–Müller counter. The excitation method. The photographic method.

Radioactive tracers
- Determining volume with a dilution method. Analysis of metabolic processes. Distribution analysis

PRACTICALS

Basic instruments for length measurement. Measuring liquid density using Mohr’s and Westphal’s hydrometer

Measurement of mass; the dependence of balance sensitivity on load. Density measurements with a picnometer

Measuring surface tension with a stalagmometer. Measuring the conductivity of electrolytes

Ostwald’s capillary viscosimeter. Höppler’s viscosimeter

Analysis of DC circuits. Temperature measurements with a thermistor
HISTORY OF PHARMACY

Medicinal treatments and medicines in ancient societies: in prehistoric times, in Mesopotamia, Egypt, India, China, Hellas and in the Roman Empire.
The rise of Christianity. Nestorius and Nestorians. Monasticism.
Medieval medicine. Medicine under Islam. The establishment of the first pharmacy.
Crusades. The rise of universities (Salerno, Montpellier and other European universities).
The first medical decree. Foundation of the first medical faculty.
Renaissance. Art and science in the Renaissance. The time of alchemy.
The emergence of medicinal chemistry (iatricchemistry), Paracelsus.
The formation of the European pharmacy, foundation of pharmacies.
The "Age of Scientific Revolution", medicine and pharmacy in the 17th century.
Innovations in the 17th century. The story of Cinchona bark.
Medicine and pharmacy in the 18th century. Innovation in the 18th century.
Medicine and pharmacy in the 19th and 20th centuries. Formation of pharmaceutical industry.
The history of medical and pharmaceutical education. History of the Hungarian pharmaceutical education and postgraduate training of pharmacists.
Dispensatoriums, Antidotariums.
Pharmacopoeias, national and international pharmacopoeias, Ph.Hg.VII.
National and international standards of drugs.
Definition and classification of drug. Expiry date. Drugs and doses. Dosage forms.
The principles of efficacy, safety of drug use. The therapeutic index and the margin of safety.
Naming of medical substances: Latinized and licensed (trade) names. The forms dispensation. Formula Magistralis, Normalis, Originalis, Nosocomialis. The three levels of drug production.
Public, clinical and hospital pharmacies. The conditions of a working pharmacy. Administration work in pharmacies.
MATHEMATICS

OBJECTIVES
During the course, those mathematical concepts, methods are concerned in the necessary depth, which are required to the study of Pharmacy. The visual meaning of the theoretical concepts is emphasized, they are introduced and illustrated by a number of practical examples and applications.

LECTURES
Basic concepts: sets, numbers, intervals, relations, functions. Elementary properties of functions: domain, range, graph, even/odd functions, periodicity, boundedness, monotonicity, concavity, maxima and minima.

Elementary functions in the life sciences: Arithmetical and geometrical growth, power functions, exponential and logarithmic functions, trigonometric functions. Compositions, one-to-one functions, inverse function. Graphical study of functions and practical processes: elementary and logarithmic transformations, logarithmic plots.


Applications: Relation between the growth and concavity and the derivatives, graphical and numerical study. Examination of functions, finding monotonicity, concavity; maxima, minima and the maximal growth rate and of processes in life sciences. Examples.


Antiderivative, indefinite integral: inversion of differentiation, understanding vector fields. Formal definition and graphical interpretation; properties; simple integration methods and rules (elementary rules, substitution, integration by parts).

Definite integral: geometric meaning (area), and formal definition. Elementary properties and rules (sum, constant multiple, partial integration and substitution rule for definite integrals). The integral mean value. Simple numerical methods of integration.

Area function, fundamental theorem of integral calculus, Newton-Leibniz formula, examples of usage. Applications: area between two curves; volumes of revolution; weight-point of a body; change of a function from the derivative.

Functions of two variables: surface graph, planar intersections, contour lines. Partial derivatives and their geometrical meaning. Local minima and maxima. Functions of several variables. Curve fitting with the least square method, linear regression.


PRACTICALS
Exercises and solutions of problems in the topics of the corresponding lectures.
INFORMATICS

PRACTICE-1st semester (15 weeks, 2 hrs/week)

WEEK

1. Basic concepts of informatics in life sciences. Terminology used in informatics and computer techniques. The role of the human component.

2. Local and Network drives; File and folder operations on physical and logical drives. Overview of computer architecture. Hardware and software. Problems with national languages - solutions.


8. AUTUMN BREAK

9. 1st practical test.

10. Data types in the pharmacological sciences. Number, date, time, money, dimensions, etc.


12. Statistical evaluation and graphical presentation of medical/pharmacological data.


14. 2nd practical test.

BIOSTATISTICS

Course description:
Aims: The subject is designed to give basic biostatistical knowledge commonly employed in pharmaceutical research and to learn modelling and interpreting results of computer programs. The main purpose is to learn how to find the most appropriate method to describe and present their data and to find significant differences or associations in the data set.

Content:
Data definition, types of data, displaying data. Characteristics of discrete and continuous distributions. Probability, random variables and their types, distributions. Some important distributions: binomial, Poisson, uniform and normal distribution and their properties.


Lecture: 1 hour per week (New Educ. Center)

Textbook: there is no textbook. Making notes at the lectures will help in preparing for the exam. A short note of the lectures will be given containing the most important definitions and description of the methods. A more detailed handout will be given in Word files.

Recommended Textbooks:

Practice: 1 hour per week (New Educ. Center)
Attending practical lessons is compulsory. Practical lessons will be held in computing cabinets. Students will use computer program to practice methods described at the lecture and to study handling computers.

Testing knowledge:
On the practical lessons students have to make two tests for a maximum sum of 100 points. The sum of the two tests will be included into the final mark of the end-semester exam. The course will be accomplished by an end-semester exam.

Rules of evaluation of practice: knowledge will be evaluated by a three grade system:

<table>
<thead>
<tr>
<th>Accomplishment</th>
<th>Practice evaluation</th>
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<tbody>
<tr>
<td>0-50 %</td>
<td>not met requirements (NOTMETRE)</td>
</tr>
<tr>
<td>51-90 %</td>
<td>met requirements /Passed (METRE/P)</td>
</tr>
<tr>
<td>90-100 %</td>
<td>met requirements /High mark (METRE/H)</td>
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</tbody>
</table>

Rules of evaluation of the end-semester exam

The end-semester exam will be evaluated by a five-grade system.
Knowledge acquired is tested based on subject matter defined by a list of topics. The exam is written; students have to evaluate a problem-sheet. The problem-sheet consists of the following parts:
1. One of the topics 100 points
2. 2 simple theoretical questions or definitions 70 points
3. 1 simple practical problem to be solved by hand calculation 30 points

\[ \text{Sum} = 200 \text{ points} \]

The exam is failed if the accomplishment of the written exam is less than 100 points (50%), otherwise; points of the practice are added to the points of the exam:
4. Points of practice 100 points
Final sum 300 points

Marks of the final exam are shown in the following table:

<table>
<thead>
<tr>
<th>Accomplishment, %</th>
<th>Accomplishment, points</th>
<th>Exam evaluation</th>
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<tr>
<td>0 - 50 %</td>
<td>0-150 points</td>
<td>failed (1)</td>
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<tr>
<td>51-62.5 %</td>
<td>151-187.5 points</td>
<td>passed (2)</td>
</tr>
<tr>
<td>63-75 %</td>
<td>188-225 points</td>
<td>acceptable (3)</td>
</tr>
<tr>
<td>76 -90 %</td>
<td>226-270 points</td>
<td>good (4)</td>
</tr>
<tr>
<td>91-100 %</td>
<td>271-300 points</td>
<td>very good (5)</td>
</tr>
</tbody>
</table>
GENERAL CHEMISTRY

1st semester

LECTURES

The science of chemistry
Chemistry as physical science. Measurements and units in chemistry.

The language of chemistry

Stoichiometry

The structure of atoms

Atoms, electrons, the periodic table

The chemical bond

Molecular structure and stability
Molecular properties and geometry. Thermochemistry.

The properties of solutions

Chemical equilibrium
The equilibrium state and the equilibrium constant. The principle of Le Chatelier. Calculation of gas phase equilibrium constant. Solutions of sparingly soluble substances: the solubility product. Qualitative analysis by selective precipitation.

Acids and bases

Oxidation-reduction

Chemical kinetics
Rate of reaction. Reaction rate and concentration. Rate law and reaction mechanism. Reaction rate and temperature. Reaction rate and equilibrium. Catalysis.

Coordination chemistry

PRACTICALS

Chemical calculations

Laboratory experiments
Separation of NaCl-CaCO₃ mixture by solvation and filtration. Preparation of distilled water and its comparison with tap water by simple analysis.
Separation of the components of a mixture by sublimation. Undercooling.
Preparation of solutions. Solubility studies.
Study on the phenomenon of osmosis. Purification of crystalline potassium-aluminium sulphate by recrystallization.
Determination of the equivalent mass of magnesium. Determination of the molar volume of gases.
Preparation of different types of chemical compounds. Preparation of a double salt.
Study of the heat of the solution. Determination of the heat capacity and the approximate atomic mass of a metal.
Electrochemical reactions. Transformation of chemical energy into electrical energy.
Oxidation of iodide ions to iodine. Oxidation reactions by KMnO₄.
Oxidation reactions by Fe(III) ions. Oxidation reaction by H₂O₂.
Effect of concentration on the rate of reaction. Oscillating reactions. Temperature dependence of reaction rate. Effect of catalysts on reaction rate.

INORGANIC CHEMISTRY

2nd semester

The aim of this course is to teach the students the following main topics: physical properties, structures, chemical behavior, synthesis and analysis of the elements on the systematic basis of the periodical table. They deal not only with classical inorganic chemistry but with aspects like: analytical, theoretical, industrial, organometallic, catalytic, bioinorganic of pharmaceutical chemistry.


HYDROGEN
Its place in the periodic table, electron configuration, physical properties, ortho and para hydrogen, isotopes of hydrogen, occurrence, synthesis and use of it.
Its chemical properties, reactions, synthesis and use of some important compounds containing it (hydrides).

NOBLE GASES
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them.
Their chemical properties, reactions, synthesis and use of some important compounds containing them.

ALKALINE METALS
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them. Ammonia solution of alkaline metals.
Their chemical properties, reactions, synthesis and use of some important compounds containing them (alkaline hydrides; oxydes; hydroxides; halogenides; complex compounds; cryptates; biological importance).

ALKALINE EARTH METALS
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them. Their chemical properties, reactions, synthesis and use of some important compounds containing them (calcium oxide; hydroxide; chloride; sulphate; EDTA complex; barium chloride, sulphate).

BERYLLIUM
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it.

BORON
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it (borides; boron halogenides; boranes; borax; boric acid).

MAGNESIUM
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it (oxyde; carbonate; sulphate; chlorophyll; Grignard compounds).

ALUMINIUM
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing them (oxyde; sulphate; trichloride; hydroxide; alumen).

SILICON
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it (oxydes; silicic acid; silicates; halogenides; silicons; siloxanes).

GERMANIUM, ARSENIC, ANTIMONY
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them. Their chemical properties, reactions, synthesis and use of some important compounds containing them (arsenic oxydes; acids; antimony pentafluoride - super acids; antimony pentasulphide; bismuth nitrate).
COPPER, SILVER AND GOLD
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them. Their chemical properties, reactions, synthesis and use of some important compounds containing them (copper sulphate; halogenides; silver nitrate; silver halogenides-photochemistry; gold chlorides).

ZINC, CADMIUM AND MERCURY
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them. Their chemical properties, reactions, synthesis and use of some important compounds containing them (zinc oxide; chloride; sulphate; metals dissolved in mercury; mercury chlorides; oxyde).

TIN, LEAD AND BISMUTH
Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them (radiation protection). Their chemical properties, reactions, synthesis and use of some important compounds containing them (oxydes; acetate).

TRANSITION METALS
General physical and chemical properties, electron configuration, occurrence, synthesis, use of them, important compounds (hydrides; Cr-oxydes, acids; Mn-oxydes, acids and bases; Fe-oxydes, hydroxydes, complex compounds; Ni, Pd, Pt, Rh, Ir-catalysis).

IRON
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it (iron; iron trichloride; sulphate; hemoglobin).

RARE EARTH METALS
General physical and chemical properties, electron configuration, occurrence, synthesis, use of them, important compounds (Ce-oxidation; Sm-pharmaceutical use; Th-physical properties; U-separation of the isotopes).

FLUORINE
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it (hydrogen fluoride, fluorides- caries prevention).

CHLORINE
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Its chemical properties, reactions, synthesis and use of some important compounds containing it (chlorine water; acids; salts of the acids).

SULFUR
Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it (ozone, natural-, deionised, distilled water, hardness of water, hydrogen peroxyde). Its chemical properties, reactions, synthesis and use of some important compounds containing it (sulfides; acids; salts and acid derivatives containing sulfur).
PHARMACEUTICAL BIOLOGY

1st semester

LECTURES

The essence of life

The chemical basis of life

The cellular basis of life

Cell division

Meiosis

The genetic make-up of the cell

Reproduction

Ontogenesis and differentiation

Human genetics

Dominant inheritance in human diseases
  Penetrance. Expressivity.

Basic mechanisms in the formation of dominant disorders

Recessiveness

Pharmacogenetics
  G-6-PD deficiency. INH sensitivity. Suxamethonium intolerance.

Multiple alleles
  Inheritance of ABO blood groups

X-linked inheritance

Polygenic (multifactorial) inheritance

Population genetics
  Ideal population. Hardy-Weinberg law. Gene frequency estimations in natural populations.

Human cytogenetics

Structural chromosomal abnormalities

Intrachromosomal rearrangements

Interchromosomal rearrangements
  - Translocations

Mutations

Human cytogenetic methodology

Human gene mapping

Genetic engineering

PRACTICALS

Inspection of cycle preparatory program.
Light microscope and phase contrast microscope. Learning the use of the microscope.
Electron microscopy and polarizing microscopy. Visiting in the electron microscopical laboratory and use of the polarizing microscope.
The nucleus. Investigation of light microscopic and electron microscopic preparations.
Investigation of cell organelles by light and electron microscopy.
Mitosis and meiosis.
Inspection of cyclic preparatory educational program.
Sex chromatin detection from own oral mucosa smear.
Embryonic development of the lancet fish and of vertebrates.
Normal karyotype.
Abnormal karyotype.
Pedigree analysis, and a study of different kinds of inherited disorders.

SPRING TERM

Artificial insemination by donors as means of overcoming male infertility. The biological characteristics of the female organism.
Alteration of generations (heterogonia and metagenesis). The malaria plasmodium and tapeworms.
Derivatives of the somites, the nephrogonotom, the somato-splanchnopleura and the intestinal tube. Embryonic development of the sauropside embryo. The embryonic shield. Development of the ancient organs and the chorion and amnion. The amniotic fluid.
The development of the allantois. The embryonic development of mammals. The production of the placenta (with the development). Slide.
Mendel's laws. Dominant and recessive normal human traits. Multiple allelism. The inheritance of ABO blood group system.
Dominant and recessive inheritance.
Pharmacogenetic enzymopathies. The inheritance of the blood group systems. X-chromosomal inheritance and X-linkedness.
Cytogenetic disorders. Numerical and structural chromosomal diseases.
### ANATOMY

**1st semester (15 weeks)**

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>2 hours per week</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Morphology of the cell I.</td>
</tr>
<tr>
<td>2.</td>
<td>Morphology of the cell II.</td>
</tr>
<tr>
<td>3.</td>
<td>Morphology of the cell III.</td>
</tr>
<tr>
<td>4.</td>
<td>Epithelial tissues</td>
</tr>
<tr>
<td>5.</td>
<td>Connective tissues</td>
</tr>
<tr>
<td>6.</td>
<td>Bone and cartilage</td>
</tr>
<tr>
<td>7.</td>
<td>Muscle tissues</td>
</tr>
<tr>
<td>8.</td>
<td><strong>AUTUMN BREAK</strong></td>
</tr>
<tr>
<td>9.</td>
<td>Nervous tissue</td>
</tr>
<tr>
<td>10.</td>
<td>The parts of the human body</td>
</tr>
<tr>
<td>11.</td>
<td>The bones of the human body</td>
</tr>
<tr>
<td>12.</td>
<td>The joints of the human body</td>
</tr>
<tr>
<td>13.</td>
<td>The main skeletal muscles</td>
</tr>
<tr>
<td>14.</td>
<td>The anatomy of the heart and large vessels</td>
</tr>
<tr>
<td>15.</td>
<td>The anatomy of the respiratory tract (nasal cavity, larynx and lungs)</td>
</tr>
</tbody>
</table>

**2nd semester (15 weeks)**

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>2 hours per week</strong></td>
</tr>
<tr>
<td>1.</td>
<td>The anatomy of the digestive system I.</td>
</tr>
<tr>
<td>2.</td>
<td>The anatomy of the digestive system II.</td>
</tr>
<tr>
<td>3.</td>
<td>The anatomy of the kidney and other organs of the urinary tract</td>
</tr>
<tr>
<td>4.</td>
<td>The anatomy of the female genital organs</td>
</tr>
<tr>
<td>5.</td>
<td>The anatomy of the male genital organs</td>
</tr>
<tr>
<td>6.</td>
<td>The histology of the ovary and testis (gametogenesis)</td>
</tr>
<tr>
<td>7.</td>
<td>The anatomy of the endocrine glands (principles of endocrine regulation)</td>
</tr>
<tr>
<td>8.</td>
<td><strong>SPRING BREAK</strong></td>
</tr>
<tr>
<td>9.</td>
<td>The anatomy of the central nervous system: the spinal cord</td>
</tr>
<tr>
<td>10.</td>
<td>The anatomy of the central nervous system: the brain stem and the cerebellum</td>
</tr>
<tr>
<td>11.</td>
<td>The anatomy of the central nervous system: diencephalon, basal ganglia, cortex cerebri</td>
</tr>
<tr>
<td>12.</td>
<td>The anatomy of the meninges and the cerebral ventricles</td>
</tr>
<tr>
<td>13.</td>
<td>The anatomy of the peripheral nervous system</td>
</tr>
<tr>
<td>14.</td>
<td>Human development I.</td>
</tr>
<tr>
<td>15.</td>
<td>Human development II.</td>
</tr>
</tbody>
</table>
QUALITATIVE CHEMICAL ANALYSIS

Concepts, aims and general methods. Ions.

Classification of reactions.


Reaction sensitivity

Reaction specificity

Groups of cations


Group 1A (hydrochloric acid sub-group): Silver(I), reaction with hydrogen sulphide, hydrochloric acid, bromides and iodides, alkali hydroxides, ammonia, chromates. Lead(II), reaction with hydrogen sulphide, chlorides, iodides, sulphates, alkali hydroxides or ammonia, chromates. Mercury(II), reaction with sulphides, chlorides, ammonia, alkali hydroxides, iodides, metallic copper.

Group 1B (copper sub-group): Mercury(II), reaction with sulphides, ammonia, alkali hydroxides, tin(II) chloride, iodides, metallic copper. Copper(II), reaction with sulphides, ammonia, alkali hydroxides, hexacyanoferrate(II), cyanides, iodides, metallic iron or zinc, flame coloration. Bismuth, reaction with sulphides, alkali hydroxides or ammonia, water, hydrolysis, tetrahydroxostannate(II), iodides. Cadmium(II), reaction with sulphides, alkali hydroxides, ammonia, cyanides.

Simple analysis of cation group 1.

Group 2 (arsenic group): Group reaction. Reagents. Arsenite [arsenic(III)], reaction with sulphides, silver ions, iodine, Marsh reaction, Bettendorf reaction, Gutzeit test, Sanger-Black test, heating test. Arsenate [arsenic(V)], reaction with sulphides, silver ions, Marsh, Bettendorf, Sanger-Black and Gutzeit reactions, magnesia mixture. Antimony(III), reaction with sulphides, water, hydrolysis, alkali hydroxides or ammonia, metallic zinc or iron, Marsh, Sanger-Black and Gutzeit tests. Antimony(V), reaction with sulphides, iodides. Tin(II), reaction with sulphides, mercury(II), alkali hydroxides, metallic zinc, luminescence test. Tin(IV), reaction with sulphides, alkali hydroxides, metallic zinc, metallic iron.

Simple analysis of cation group 2.


Simple analysis of cation group 3.


Simple analysis of cation group 4.


Simple analysis of cation group 5.

Groups of anions.


QUANTITATIVE CHEMICAL ANALYSIS

LECTURES

The nature, role and importance of quantitative analytical chemistry in the industry, research and medical practice. The fundamental concepts and methods of analytical chemistry.

The measuring equipment and their calibration used in analytical chemistry. The sampling, sample treatment and preparations, techniques in component concentration and separation. Dissolving, fusion, mineralization of the samples.

Basic principles of gravimetry; solubility of precipitates, factors influencing the solubility of precipitates. Mechanism and conditions of analytical precipitation. Impurities in precipitates. Techniques used in precipitation. Washing, filtering, thermal treatment and weighing of precipitates. Calculating the gravimetric results. Gravimetric determination of cations and anions. Precipitates formed by organic reagents.


Redox equilibrium in analytical chemistry. Influencing factors on redox potential. Calculation of redox potential change during the titration, construction of titration curve. Role of induced reactions and catalysis in redox titrations. Indication methods of end-point, mechanism of indications, influencing factors on redox indicators.

Preparation and standardization of potassium permanganate solution. Direct, indirect and back titration in permanganometry.

Preparation and standardization of the titrants in cerimetry and chromatometry. Cerimetric and chromatometric determination of iron(II), hydrogen-peroxide, alcohols and organic acids. Determination of chemical oxygen demand of natural waters.

Influencing factors in bromatometric redox systems. Preparation of titrant in bromatometry. Determinations based on addition and substitution reactions of organic compounds with bromine. Direct titration with potassium bromate standard solution; determination of As(III), ascorbic-acid, azophenum. Back titrations in bromatometry. Determination with bromine chloride.


Ultraviolet visible and infrared spectrophotometry. Fluorometric methods.
Separation methods of instrumental analysis. Principles and applications of gas chromatography, high performance liquid chromatography and ion chromatography. Basic principles of resonance methods (NMR, ESR) and mass spectrometry.

PRACTICALS

2nd semester
Introduction:
- Health and accident prevention regulations.
- The use of volumetric glassware.
- Procedure of chemical analysis.
- Calculation of analytical results and solving of problems.

Gravimetry:
- Gravimetric determination of sulfate ion in form of BaSO₄.
- Gravimetric determination of aand calcium ion in form of CaC₂O₄·H₂O.

Acidi- and alkalimetry:
- Preparation and standardization of hydrochloric acid and sodium hydroxide standard solution.
- Titration of week acids (acetic acid).
- Titration of a mixture of strong and week acids (sulphuric and boric acid).
- Determination of sodium thiosulphate (multiplying procedure).
- Determination of amonia in ammonium salts by destillation.
- Determination of potassium ion by ion exchange separation.

Argentometry:
- Preparation and standardization of silver nitrate and potassium thiocyanate titrant.
- Titration of bromide ion by Volhard method (back titration).

Instrumental analysis:
- Spectrophotometry: determination of salicylic acid
- Flame photometry: determination of alkaline ions

FIRST AID AND RESUSCITATION

People need to know what to do in an emergency before medical help arrives. Since you are the person most likely to be first on the scene of an emergency, it is important that you know how to recognize emergency and how to respond. This course will prepare you to make appropriate decisions regarding first aid care and to act on those decisions.

The students are able to recognize the life-threatening problems and immediately to begin first aid and resuscitation while the ambulance service (emergency team) arrives at the scene.

<table>
<thead>
<tr>
<th>Date</th>
<th>Themes</th>
<th>Teacher(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Feb</td>
<td>Rautek’s manoeuvre, log-roll technique, KED, paramedic-EMC-NIC introducing, helmet removing.</td>
<td></td>
</tr>
<tr>
<td>22. Feb</td>
<td>Unconscious patients, BLS, XBLS, AED</td>
<td></td>
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<tr>
<td>1. March</td>
<td>Unconscious patients, BLS, XBLS, AED – practice</td>
<td></td>
</tr>
<tr>
<td>22. March</td>
<td>Heimlich manoeuvre. Stable position (Gabor’s manoeuvre). Esmarch-Heiberg manoeuvre. Laryngeal mask, ET.</td>
<td></td>
</tr>
<tr>
<td>26. April</td>
<td>Rescuing technique. First aid technique.</td>
<td></td>
</tr>
<tr>
<td>10. May</td>
<td>Repeat: BLS, opening airways, ventilation, chest compression, stopping the bleeding, application of bandage, splinting technique, immobilization technique, Trendelenburg position, log-roll, Rautek, Heimlich, helmet removing, stabilization of body.</td>
<td></td>
</tr>
<tr>
<td>17. May</td>
<td>Final examination.</td>
<td></td>
</tr>
</tbody>
</table>
SHORT HISTORY OF HUNGARY

1st semester

Orientation, introduction.
The origin of the Hungarians, ancient history.
The early Middle Ages, the foundation of the Hungarian State.
Hungary as a Central European power, the age of the Anjous.
The age of the Hunyadis /János and Mátyás Hunyadi/.
Tripartite division of Hungary.
Efforts to unify the country, the Principality of Transylvania.
Reformation in Hungary, Rákóczi-rebellion.
Hungary as a part of the Habsburg Empire.
The "era of reform" 1825-1848.
The revolution and war of independence 1848-1849.

2nd semester

The fall of the revolution, revenge and compromise.
The period of dualism, the structure of Austro-Hungarian Monarchy.
Hungary in the First World War.
Decline of Austro-Hungarian Monarchy. The consequences of the First World War, peace-treaty of Trianon.
The interwar period. The regime of Horthy.
Hungary in the Second World War.
After the Second World War. The short-lived Hungarian democracy /1945-47/.
Revolution in 1956.
The Kádár regime /1956-89/.
Elections in 1990, a change in political life. Hungary today, a contemporary history.
Short history of Szeged.
<table>
<thead>
<tr>
<th>WEEK</th>
<th>PRACTICE</th>
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<tbody>
<tr>
<td></td>
<td><strong>(4 hrs/week)</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Introduction and group discussion. Interviewing: asking and answering Yes/No and Wh-questions.</td>
</tr>
<tr>
<td>2.</td>
<td>Reading comprehension: skimming texts, understanding the essence of texts. Reading and discussing articles about hot issues on diseases and their cures.</td>
</tr>
<tr>
<td>3.</td>
<td>Vocabulary expansion, reading about recent advances in pharmacology. Video watching and discussion on the same topic.</td>
</tr>
<tr>
<td>5.</td>
<td>Listening skills: listening to a recording on vitamins and their effects, note taking exercise. Practising the Passive Voice.</td>
</tr>
<tr>
<td>9.</td>
<td><strong>AUTUMN BREAK</strong></td>
</tr>
<tr>
<td>10.</td>
<td>Reading skills: preparing study notes from lengthy texts, identifying most important facts. Description, cause and effect. Understanding and memorizing definitions.</td>
</tr>
<tr>
<td>11.</td>
<td>Focussing on grammar and vocabulary expansion: CFC practice tests and health vocabulary tests.</td>
</tr>
<tr>
<td>14.</td>
<td>Guided note taking. Listening to a recording on constipation and its cures. Developing patient advice leaflets from notes.</td>
</tr>
</tbody>
</table>
### 2nd semester (15 weeks)

<table>
<thead>
<tr>
<th>WEEK</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>(4 hrs/week)</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Organizing written notes and identifying main points. Lecture notes taken from Biology. Commonly used abbreviations and their interpretation.</td>
</tr>
<tr>
<td>3.</td>
<td>Essay writing on the importance of the pharmacist in giving advice on a healthy diet. Suggestions and recommendations. The use of MUST/SHOULD/WOULD.</td>
</tr>
<tr>
<td>4.</td>
<td>Reading skills: developing faster reading and deeper understanding of read texts. Accomplishing reading comprehension tasks. CAE Reading Test.</td>
</tr>
<tr>
<td>5.</td>
<td>Vocabulary expansion: preparing word-nets concerning internally used medicines. Adjectives, Comparatives and Superlatives.</td>
</tr>
<tr>
<td>8.</td>
<td>Developing awareness of proper and improper sentence constructions, grammar and vocabulary. Error spotting in essays written by group mates.</td>
</tr>
<tr>
<td>10.</td>
<td><strong>SPRING BREAK</strong></td>
</tr>
<tr>
<td>11.</td>
<td>Reading and understanding Tables. Numericals, decimals, reading out numbers.</td>
</tr>
<tr>
<td>13.</td>
<td>Vocabulary expansion: English words of Greek and Latin origin in the field of Pharmacy. Prefixes and suffixes giving oppositional meaning to adjectives and adverbs.</td>
</tr>
<tr>
<td>15.</td>
<td>Vocabulary and grammar revision. CAE and Medical Practice tests. Final test.</td>
</tr>
<tr>
<td>WEEK</td>
<td>PRACTICE</td>
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<tr>
<td></td>
<td><strong>(2 hrs/week)</strong></td>
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<tr>
<td>5.</td>
<td>Grammar revision exercises. Ointment, oil.</td>
</tr>
<tr>
<td>9.</td>
<td><strong>AUTUMN BREAK</strong></td>
</tr>
<tr>
<td>10.</td>
<td>4th declension.</td>
</tr>
<tr>
<td>11.</td>
<td>Herbal teas. 5th declension.</td>
</tr>
<tr>
<td>12.</td>
<td>Comparison of adjectives.</td>
</tr>
<tr>
<td>13.</td>
<td>Participles in the pharmaceutical language. Herbs and plants.</td>
</tr>
<tr>
<td>14.</td>
<td>Revision.</td>
</tr>
<tr>
<td>15.</td>
<td>Final test.</td>
</tr>
</tbody>
</table>
QUANTITATIVE CHEMICAL ANALYSIS

LECTURES

The nature, role and importance of quantitative analytical chemistry in the industry, research and medical practice. The fundamental concepts and methods of analytical chemistry.

The measuring equipment and their calibration used in analytical chemistry. The sampling, sample treatment and preparations, techniques in component concentration and separation. Dissolving, fusion, mineralization of the samples.

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Redox equilibrium in analytical chemistry. Influencing factors on redox potential. Calculation of redox potential change during the titration, construction of titration curve. Role of induced reactions and catalysis in redox titrations. Indication methods of end-point, mechanism of indications, influencing factors on redox indicators.


Reductometric methods: titanometry, ascorbinometry.


Separation methods of instrumental analysis. Principles and applications of gas chromatography, high performance liquid chromatography and ion chromatography. Basic principles of resonance methods (NMR, ESR) and mass spectrometry.

3rd semester

Complexometry:
- Preparation and standardization of EDTA standard solution.
- Determination copper(II)-ion.
- Titration of calcium- and magnesium ions in mixture.

Permanganometry:
- Preparation and standardization of potassium-permanganate standard solution.
- Titration of hydrogen-peroxide.
- Determination of iron(II) ion.
Bromatometry:
- Preparation of potassium bromate standard solution.
- Titration of arsenic(III) ion by Győry.
- Determination of antipyrin by bromine substitution reaction.

Jodometry:
- Preparation and standardization of sodium-thiosulfate solution.
- Determination of phenol by Koppeschaar.
- Titration of thiocyanate ion by Schulek.
- Jodometric determination of copper(II) ion.

Instrumental analysis:
- Conductometric titration: determination of oxalic acid
- Coulombmetry: determination arsenic(III) ion
- Potentiometry: alkalimetric titration of phosphoric acid
- Voltametry: iodometric titration of iodate by amperometric end point detection
- Chromatography: gas chromatographic analysis of alcohols or HPLC measurement of phenolic compounds

PHYSICAL CHEMISTRY

LECTURES

Thermodynamics
- The first law of thermodynamics
- The second law of thermodynamics
- The third law of thermodynamics
- Phase equilibrium
- Chemical equilibrium
- Electrochemical equilibrium
- Ion transport
- Reaction kinetics

PRACTICALS

Thermochemistry
- Determination of the heat of neutralization.

Phase equilibria
- Reaction kinetics

Electric conductance
- Study of dissociation by electric conductance. Dependence of conductivity on concentration. Solubility by conductivity measurements.

Electromotive force
- Study of redox electrodes. Dependence of electrode potential on the concentration of electrolyte. Concentration cells. Determination of pH.

Experiments based on optical methods
ORGANIC CHEMISTRY

3rd semester

LECTURES

Structure and bonding.

Ionic bonds, covalent bonds. Hybridization: sp$^3$, sp$^2$ and sp orbitals.
The nature of organic compounds: alkanes.


Alkenes: the nature of organic reactions.


Alkenes and alkynes.

Addition of HX to alkenes, hydration of alkenes. Hydrogenation and oxidation of alkanes.

Aromatic compounds.

Structure and chemistry of benzene: electrophilic aromatic substitution. Reactivity and orientation in electrophilic aromatic substitution.

Stereochemistry

Optical activity, sequence rules for specification of configuration. Diastereomers, meso compounds, racemic mixture.

Alkyl halides

Preparation and reaction of alkyl halides. The $S_N2$, $S_N1$ reaction and elimination reaction.

Alcohols, ethers and phenols

Properties and reactions of alcohols. Synthesis and reactions of phenols and ethers.

4th semester

LECTURES

Aldehydes and ketones: nucleophilic addition reactions.


Carboxylic acids and derivatives


Carbonyl alpha-substitution reactions and condensation reactions

Reactivity of enols, enolate ion formation. The aldol reaction and condensation of esters.

Amines

Structure and synthesis of amines. Reaction of amines and heterocyclic amines.

Structure determination

Infrared spectroscopy of organic molecules. Nuclear magnetic resonance spectroscopy.

Biomolecules: carbohydrates

Configurations and cyclic structure of monosaccharides. Reactions of monosaccharides, disaccharides.

Amino acids, peptides and proteins

Structure of amino acids, covalent bonding in peptides. Peptide sequencing and the peptide synthesis.

Lipids and nucleic acids

Phospholipids and steroids. Structure and replication of DNA, synthesis of RNA.

PRACTICALS IN THE 3RD AND 4TH SEMESTERS

1. Basic methods of synthetic organic chemistry; Distillation; Crystallization, melting point; Extraction; Chromatography

2. Reactivity of functional groups in organic compounds (hydrocarbons, halogeno compounds, hydroxyl derivatives, amino derivatives, carbonyl compounds, carboxylic acids and derivatives, saccharides)

3. Syntheses (oxidation, reduction, nucleophilic substitution, electrophilic substitution, electrophilic addition, esterification, acylation, condensation, cyclocondensation, synthesis of representative compounds with pharmacological activities)
PHYSIOLOGY

3rd semester

LECTURES

Introduction
Anatomy-histology
Membrane physiology
Transmission
Autonomic nervous system
Muscle physiology
Blood physiology
Heart physiology
Circulation
Skin, thermoregulation
Respiration physiology

PRACTICALS


Studies on nerve-muscle preparation (frog): video, anaesthesia, righting (turning) reflex, decapitation, lesioning of the spinal cord, studies on nerve-muscle preparation, direct and indirect stimulations, stimulus summation, complete and incomplete tetanus, rheobasis, chronaxia, recording of fatigue in the muscle.

Principles of blood tests: the microscope in hematological tests, sterilization and desinfection, methods of taking blood (vein, fingertip), using and cleaning of the diluting pipettes, Bürker's chamber, Westergren's tube, centrifuges, blood smear. Principles of bleeding time, blood clotting time, staining index, Price-Jones' curve, partial thromboplastin time, thrombin time.

Visit at the Department of Anatomy.

Blood tests: hematocrit (micro-, macro-), determination of hemoglobin concentration (Drabkin), erythrocyte sedimentation rate by Westergren, differential count (leukocytes), osmotic resistance of red blood cells. Prothrombin time: blood groups (AB0, Rh), red blood cell count, white blood cell count, thrombocyte count (Fischer-Germer), reticulocyte count.

Studies of the circulatory system: video, in situ registration of the activity of the heart in the frog, effects of electrical and thermal stimulations of the heart, Stannius' ligatures, summation, all or none law, Goltz reflex, circulation in the frog tongue, the lymphatic heart of the frog, isolated and surviving frog's heart preparations, effects of ions (adrenaline, acetylcholine, atropine) on the heart, study of the peripheral circulation in the frog (Laewan-Trendelenburg), experiments in the isolated rat heart preparation (Langendorf perfusion).

The human circulatory and respiratory system: ECG, peripheral pulse, characteristics of the radial pulse, palpation over the chest, auscultation over the heart, the effects of physical exercise on circulation, spirometry, determination of inspiratory and expiratory pressures, effects of breathing on the circulation, cold pressor test, blood pressure measurement.

4th semester

LECTURES

GI: anatomy, endocrine, motor, secretion, absorption.
Vitamines, nutrition, metabolism.
Kidney: anatomy, filtration, clearance, tubular function, hormones, micturition.
Volumen-, osmo-, pH regulation.
Endocrine system.
Hypothalamus-hypophysis: oxitocin, vasopressin.
Adenohypophysis.
Thyroid gland.
Calcium metabolism.
Adrenal cortex.
Pancreas.
Sexual functions.
CNS: anatomy, neural network.
Motor system.
Somatosensory system, receptors.
Pain.
Vision.
Hearing, smelling, taste.
Sleep.
Instinct, emotion.
Learning, memory, cerebral cortex.

**PRACTICALS**

General information. Video (GI tract, liver). Collection of gastric juice, test meal (principle)
Pregnancy tests.
Thorn’s test (principle).
The effect of insulin on blood glucose level.
Video (Sleep, behavior).
COLLOID CHEMISTRY

LECTURES

Introduction
Colloidal state and systems
Major characteristics of colloidal systems: classification, definition, delimitation and comparison.
Incoherent (incohesive) and coherent (cohesive) colloidal systems.

Macromolecular colloids
Chemical structure of macromolecules.
Characterization of macromolecular coils.
Preparation of polymeric materials.
Macromolecular solutions, molecular mass determination.
Polyelectrolytes, structure and solution behavior.

Association colloids
Structure and types of amphiphilic molecules, HBL scale.
Micelle formation equilibrium.
Structure of micelle.
Critical micelle formation concentration.
Physical-chemical properties of surfactant solutions.
Solubilization in surfactant solutions.

Interfaces
Interfacial phenomena, interfacial energy.
Gas/liquid, liquid/liquid interfaces. Surface tension, surface activity, excess amounts, spreading.
Monomolecular films.
Gas/solid and liquid/solid interfaces. Adsorption.
Adsorbs.
Spreading and wetting.
Charged interfaces, electric double layer.
Electrokinetic phenomena.

Preparation, characterization and stability of colloid and coarse disperse systems
Classification and characterization of colloid and coarse disperse systems.
Spontaneous and forced changes in colloidal state, preparation and destabilization, colloidal stability.
Aerosols, foams, emulsions, microemulsions, suspensions and sols.

Structural characterization of colloidal systems
Particle size and shape. Size distribution. Measuring methods.
Coherent systems, gels. Rheology, flow curves, tixotropy.

PRACTICALS

Safety precaution, fire protection.
Viscosity of polymer solutions.
Effect of surface active agents on surface tension of water.
Solubilization of organic acids.
Adsorption from solution, determination of specific surface of adsorbent.
Emulsions, microemulsions.
Spreading and wetting. Making of monomolecular films by Pockels method.
BIOCHEMISTRY

Enzymology
  Definition and scope of biochemistry
  Conditions of processes in biological systems
  Living organism as a thermodynamically open system
Protein structure
  Functions of proteins in the organism
  Protein composition/structure
  Protein conformation
Enzymes
  Enzymatic action
  Models
  Types of proteases
  Coenzymes
  Classification of enzymes.
  Isoenzymes, their clinical importance
  Units of enzyme activity
Enzyme kinetics
  Role of enzymes during catalysis
  Steady state
  Order and conditions of reactions
  $K_m$
  Lineweaver-Burk equation/plot
  Kinetics of inhibition
Carbohydrate metabolism
  Energy generation
  Storage
  Synthesis of glucose (gluconeogenesis) from non-carbohydrate precursors: glycerol (from neutral lipids), glucogenic amino acids
  Importance of hexose monophosphate shunt
  Relationship between the carbohydrate metabolism and other metabolisms
Lipid metabolism
  Amino acid metabolism
  Nucleotide metabolism
  Citric acid cycle, terminal oxidation and oxidative phosphorylation
    Citric acid cycle as the central pool of the intermediate metabolism
    Definition of terminal oxidation, redox systems in the organism
    Oxidative phosphorylation
Biochemical characterization of the connective tissue and the cytoskeleton
  Collagen structure and its synthesis
Biochemistry of membranes
  Structure of biological membranes, fluid mosaic model
  Membrane proteins and transport systems
Biochemistry of contractile tissues
  Types of contractile tissues
  Regulation of muscle contraction by calcium
Biochemistry of the neural tissue and vision
Biochemistry of the blood
  Organic components of the blood plasma
  Biochemical characteristics of blood cells
  Biochemistry of blood clotting and fibrinolysis
Biochemistry of the liver and biotransformation
  Structure of liver and its microcirculation system
  Biotransformation
  Biochemical effects of alcohols
Biochemistry of hormones
  Chemical and biochemical classification of hormones
  Biochemistry of thyroid and parathyroid hormones
  Hormonal regulation of blood glucose level
  Biochemistry of steroid hormones
Tissue hormones, growth factors
Regulation of gene expression
General principles of biochemical regulation, adaptation, limits of adaptation
  Signalling systems
  Cyclic nucleotide dependent signalling systems
  Phosphorylation and dephosphorylation as regulation mechanisms
  General principles of biochemical regulation

PHARMACEUTICAL BOTANY

LECTURES

The plant cell. Organs of the plant cell and their roles.
The plant tissues: embryonic tissues apical meristems
Secondary meristems: lateral meristems, intercalar meristems
The ground tissues: parenchyma, collenchyma, schlerenchyma
Secretory cells and tissues
Vascular tissues: xylem, phloem
Dermal tissues: epidermis (stomata, trichomes); periderm
The root, the types of the roots
Root apex, root cap.
The tissue structure of the primary root
Secondary growth in thickness in the root
The shoot, the shoot modifications
The primary vascular system of the stem
Secondary body of the stem (vascular system)
Stem of woody and herbaceous dicotyledons
Morphology of the Angiosperm leaves, the types of the leaves
The histology of Angiosperm leaf
The flower, the parts of angiosperm flower (sepals, petals, stamens, carpels, gynoecium, the ovule)
The flower diagram, flower formula
Polination, double fertilization, development of the embryo
The inflorescence, types of inflorescences
The fruits, types of fruits
The seed: development and histology.
The important taxonomic units and the nomenclature of plants
The most fundamental divisions of plants (the taxonomy of plant kingdom)

Dicotyledonopsida
Characterization of the plant families: Magnoliaceae, Berberidaceae, Aristolochiaceae, Ranunculaceae, Papaveraceae,
  Fumariaceae, Cannabinaceae, Urticaceae, Fagaceae, Betulaceae, Juglandaceae, Caryophyllaceae, Polygonaceae, Tiliaceae,
  Malvaceae, Brassicaceae, Primulaceae, Rosaceae, Fabaceae, Myrtaceae, Celastraceae, Rhamnaceae, Rutaceae,
  Linaceae, Geraniaceae, Apiaceae, Caprifoliaceae, Valerianaceae, Boraginaceae Lamiaeae, Solanaceae, Scrophulariaceae,
  Plantaginaceae, Asteraceae,
Characterization of Monocotyledonopsida: Liliaceae, Poaceae

PRACTICALS

The Living Plant Cell
  The structure and properties of the plant cell. Potoplasmic and non-protoplasmic cell content. cell
Plant Tissues
  Simple Tissues:
    - Parenchima or Fundamental Tissue
    - Ordinary Parenchyma
    - Reserve Parenchyma
    - Assimilation Parenchyma
Roots
  Structure of primary thickened roots
  Structure of secondary thickened roots
Rhizomes, Stems and Barks
  Young dicotyl stem
Secondary thickening of dicotyledonous stems

Barks

Foliage Leaves
- General structure of foliage leaves
- Crystals with diagnostic importance in clarified leaves

Fruits and Seeds
- Cremocarp, hesperidium fruit, berry
- Hystology of seeds

Taxonomy
- Characterisation of some especially important plant family containing medicinal plants in a large number (Boraginaceae, Brassicaceae, Lamiaceae, Solanaceae, Scrophulariaceae, Rosaceae, Asteraceae), identification of plants

Excursion in the Botanical Garden

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**PHARMACEUTICAL PROPEDEUTICS**

4th semester (15 weeks)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>Lecture</th>
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<tbody>
<tr>
<td>1.</td>
<td>Definition of drugs, classification of drugs. Active substances, additives, pharmaceutical preparations, dosage forms</td>
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<td>2.</td>
<td>Medical prescription. History of medical prescription, part of prescription, legal condition-system of prescription writing</td>
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<td>3.</td>
<td>Types of drug order (formula magistralis, formula normalis, formula originalis, formula officinalis, formula nosocomialis</td>
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<td>4.</td>
<td>Pharmacies. Types of pharmacies (public pharmacy, branch pharmacy, ‘hand’ pharmacy, hospital pharmacy). Establishment of pharmacies, equipment and fittings in pharmacies, function of pharmacies</td>
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<td>5.</td>
<td>Pharmacopoeias I. Functions and structures of pharmacopoeias. Hungarian Pharmacopoea Ed. VII and VIII.</td>
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<td>7.</td>
<td>Dosage forms in pharmacopoeias (solid, liquid and semisolid dosage forms, human and veterinary medicines, classification of dosage forms according to application place. ATC code</td>
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<td>8.</td>
<td>SPRING BREAK</td>
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<tr>
<td>11.</td>
<td>Drug research (Phase 0, Phase I, Phase II, Phase III, Phase IV) Pharmaco-economic investigation, investigations of quality of life</td>
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<tr>
<td>12.</td>
<td>Registration of drugs. Patents, listed medicines, generic medicines</td>
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</table>
14. Education of pharmacist, gradual- and postgradual education, Special training, further education

15. Pharmaceutical calculation (unit of mass, solubility, calculation of concentration, checking of dose). Basic operation in pharmacies measurement of mass, balances, etc.)
SYLLABUS FOR 3RD YEAR PHARMACY STUDENTS

PHARMACOGNOSY

5th semester

About pharmacognosy in general. The history of pharmacognosy.
Plant nomenclature and nomenclature of plant drugs. What is a plant drug?
Collection and cultivation of medicinal plants.
About plant drugs. The preparation of plant drugs.
Basic metabolic pathways. Primary metabolites. The origin of carbohydrates.
The formation of fats and proteins.
Secondary metabolites. The origin of terpenoids.
The formation of phenolic compounds and alkaloids.
About carbohydrates in general. The types, occurrence, uses (in medicine) of carbohydrates.
Honey, Tamarind pulp, manna, fig.
Rose fruits.
Starches.
Gums and mucillages. Tragacantha, acacia gum, agar, cotton.
Carrageen, sterculia gum, psillium, marshmallow root, linseed.
Fats, fixed oils, waxes. Arachis oil, sesame oil, olive oil.
Castor oil, coconut oil, linseed oil, theobroma oil.
Hydnocarpus oil, bees wax, spermaceti.
Prostaglandins.
Enzymes, pepsin.
Isoprenoid compounds (in general, biogenesis).
Monoterpenes, volatile oil (preparation, characters, uses)
Peppermint leaf and oil, spermint oil.
Lavender oil and flower. Rosemary oil and leaves. Oil of rose.
Caraway and caraway oil. Coriander and coriander oil.
Dill and dill oil.
Thyme, eucalyptus oil and leaves.
Cardamon fruit, bitter orange peel.
Lemon peel, juniper berries and oil.
Aniseed and aniseed oil, fennel, cinnamon and cinnamon oil.
Star anis fruit and oil. Camphor.
Clove and clove oil. Nutmeg and nutmeg oil.
Calamus, ginger, turmeric.
Iridoids, gentian roots.
Valerian.
Sesquiterpenes, chamomile flowers.
Matricaria flowers.
Fish berries, santonica flowers.
Sandal wood, oil of cade.
Diterpenoids, colophony resin and turpenine.
Asafoetida, myrrh, triterpenoids (biogenesis of triterpenoids).
Ginseng, senega root.
Valiila bark, licorice.
About steroids in general (biogenesis of steroids).
Steroidal saponins (dioscorea, solanum, sarsaparilla root).
Natural steroids as staring materials for partial synthesis of pharmaceuticals.
About cardioactive glycosides containing drugs in general.
Digitalis (purpurea) leaf.
Digitalis lanata leaf.
Strophamtus and other (nerium, thevetia, convallaria, adonis) cardenolid containing drugs.
Bufadienolids and its drugs (squills, black hellebore rhizom).
6th semester

Alkaloids in general. Ornithine-derived alkaloids. Tropane alkaloids.
Stramonium leaf. Duboisia leaves. Coca leaf and Cocaine.
Hydrastis. Ipecacuanha. Colchicum seed and Corm.
Simple phenolic compounds. Vanilla and Vanillin. Baerberry leaves.
Capsicum. Indian hemp. Henna.
PHARMACEUTICAL CHEMISTRY

5th semester

LECTURES

GENERAL PART

Definition and classification of drugs or pharmaceuticals. The history and development of drug control. Nomenclature of drugs. Physical, physico-chemical and chemical investigations of pharmaceuticals and substances used in pharmacy. Identification and qualitative tests, quantitative assays.

INORGANIC PART

Halogen group. Chlorine water, Iodine, Hydrochloric acid, Sodium fluoride, Sodium chloride, Potassium chloride, Sodium bromide, Potassium bromide, Sodium iodide, Potassium iodide, Potassium chloride, Potassium perchlorate. 
Oxygen compounds. Demineralized water, Distilled water, Hydrogen peroxide solution 30%, Potassium hydroxide, Sodium hydroxide.
Sulphur and its compounds. Purified sulphur powder, Precipitated sulphur, Sodium disulphite, Potassium sulphate, Sodium sulphate, Sodium thiosulphate.
Phosphoric acid and its salts. Sodium dihydrogenphosphate, Disodium hydrogenphosphate, Calcium hydrogenphosphate, Tricalcium phosphate.
Compounds of arsenic, antimony and bismuth. Arsenic oxide, Bismuth oxynitrate.
Carbon group. Activated charcoal, Carbon dioxide, Lithium carbonate, Sodium carbonate, Potassium carbonate, Potassium thiocyanate.
Silicon compounds. Hydrophilic colloidal silica, Hydrophobic colloidal silica, Talc, Magnesium trisilicate, White clay.
Lead compounds. Lead monoxide, Lead acetate.
Boron compounds. Boric acid, Sodium borate.
Aluminium compounds. Dried aluminium hydroxide, Aluminium sulphate, Crystalline potassium aluminium sulphate, Aluminium chloride.
Zinc compounds. Zinc chloride, Zinc oxide, Zinc sulphate.
Mercury and its compounds. Mercury, Mercury(I) chloride, Mercury(II) amidochloride, Red mercury iodide, Yellow mercury(II) oxide, Mercury(II) sulphide.
Copper and silver compounds. Copper(II) sulphate, Silver nitrate.
Iron and its compounds. Powdered iron, Reduced iron, Iron(III) chloride, Iron(II) sulphate.
Manganese compounds. Potassium permanganate.
Calcium compounds. Calcium chloride, Calcium bromide, Calcium oxide, Dried calcium sulphate, Calcium carbonate.
Magnesium compounds. Magnesium chloride, Magnesium carbonate, Magnesium oxide, Magnesium sulphate.
Barium compounds. Barium sulphate.

ORGANIC PART

Drugs acting on the central nervous system

General anaesthetics
Intravenous anaesthetics. Hexobarbital, Thiobutabarbital Sodium, Thiopental Sodium, Methohexital Sodium, Ketamine, Propanidid, Etomidate.
Sedative-hypnotics, hypnotics
Alcohols. Ethanol, Disulfiram, Methylpentynol, Chlorobutanol.
Aldehydes. Paraldehyde, Chloral Hydrate.
Urethanes. Urethane, Ethinamate.
Ureas. Bromisoval, Carbromal.
Benzodiazepine derivatives. Nitrazepam, Flunitrazepam.
Other derivatives. Methaqualone, Glutethimide, Thalidomide
Anticonvulsant drugs
Barbiturates. Phenobarbital.
Pyrimidinediones Primidone.

Hydantoins. Phenytoin, Mephentyoin.
2,4-Oxazolidinediones. Trimethadione, Paramethadione.
Succinimides. Ethosuximide, Morsuximide.
Other derivatives. Phenacemide, Valproic Acid, Sulthiam, Carbamazepine.

Narcotic analgesics
Stucture of morphine, Analysis of morphine derivatives, Biotransformation of morphine derivatives.

Non-steroidal anti-inflammatory agents, analgesics and antipyretics.
Salicylic acid derivatives. Synthesis and analysis of salicylic acid derivatives, Biotransformation of salicylic acid derivatives, Salicylic Acid, Sodium Salicylate, Acetylsalicylic Acid, Methyl Salicylate, Salicylamide, Benorilate.
Aniline derivatives. Acetanilide, Paracetamol, Phenacetin.
Anthranilic acid derivatives. Mefenamic Acid, Flufenamic Acid, Tolfenamic Acid, Nifluminic Acid.
Arylacetic acid and aryIpropionic acid derivatives. Indomethacin, Diclofenac Sodium, Ibuprofen, Naproxen.

Anti-inflammatory steroids
Preparation and analysis of glucocorticoids, Structure-activity considerations, Prednisolone, Hydrocortisone, Mazipredone, Betamethasone, Beclometasone.

Neuroleptics

Antidepressants
Tricyclic antidepressants. Imipramine, Protriptylin, Trimipramine, Amitriptyline, Nortriptyline, Doxepine, Dibenzepine.
Monoamine oxidase inhibitor antidepressants. Phenelzine, Tranylcypromine, Pargyline, Clorgilnine.
Second-generation antidepressants. Maprotiline, Amoxapin, Mianserin, Trazodone, Viloxazine, Fluoxetine.
Lithium salts. Lithium Carbonate.

Antiparkinsonism agents
Central anticholinergics. Procyclidine, Trihexyphenyldil, Tolperisone.
Antihistamines. Diethazine, Methixene.
Drugs which increase brain levels of dopamine. Levodopa, Selegilme, Benserazide, Bromocriptine, Amantadine.

Psychomotor stimulants and anoretics
Psychomotor stimulants. Amphetamine, Metamphetamine.

Analpeptics. Strychnine, Lobeline, Camphor, Pimecione, Nikethamide, Pentetrazol, Picrotoxin, Etamivan, Doxapram.
Nootropics.
Glutaminic acid, Piracetam.

Anxiolytics
Propanediol carbamate anxiolytics. Meprobamate.

Other anxiolytics. Trimetozine, Benzocatmine.
Hallucinogens
LSD, Mescaline, Tetrahydrocannabinol.
Practicals

week 1


week 2

*Natrii chloridum* It. A, B, Pt. Appearance of solution, Acidity or alkalinity, Ferrocyanides, Iodides, Phosphates, Sulphates, Arsenic, Barium, Iron, Heavy metals, Informative test: 2, 3

Seminar: Reagents, limit test solutions and colorimetric matching fluids. Identifying and general purity tests of European Pharmacopoeia 4th Ed.

week 3

*Ammonii chloridum* It. A, B, Pt. Appearance of solution, Acidity or alkalinity, Bromides and iodides, Calcium, Assay, Informative test: 2, 3

*Kalii chloridum* It. A, B, Pt. Appearance of solution, Acidity or alkalinity, Iodides, Sulphates, Heavy metals, Iron, Informative test: 2, 3

*Kalii perchloras* It. A, B, C, D, Informative test: 2, 3


week 4

*Kalii iodidum* It. A, B, Assay, Informative test: 3

*Natrii iodidum* It. A, B, Pt. Appearance of solution, Alkalinity, Iodates, Sulphates, Thiosulphates, Heavy metals, Iron, Informative test: 1, 3

*Iodum* It. A, B, Pt. Bromides, chlorides

*Natrii fluoridum* It. A, B, C, Informative test: 1

Seminar: Sulphur and sulphur compounds. Compounds of the nitrogen group, salts of the phosphoric acid. *Sulfur ad usum externum, Natrii metabisulfis, Natrii sulfis, Kalii sulfas, Natrii thioureas, Nitrogenium, Ammonii solutio concentra inus, Ammonii chloridum, Ammonii bromidum, Dinitrogenii oxidum, Natrii nitris, Kalii nitras, Natrii dihydrogenophosphas, Kalii dihydrogenophosphas, Dinatrii phosphas, Dikalii phosphas, Calcii hydrogenophosphas, Tricalcii phosphas.*

week 5

*Aqua purificata* Pt. Nitrates, Acidity or alkalinity, Oxidisable substances, Chlorides, Sulphates, Ammonium, Calcium and magnesium

*Hydrogenii peroxidum 30 per centum* It. A, B

*Natrii bromidum* It. A, B, Pt. Chlorides, Assay, Informative test: 1, 3

*Kalii bromidum* It. A, B, Pt. Appearance of solution, Acidity or alkalinity, Bromates, Iodides, Sulphates, Heavy metals, Iron, Informative test: 2, 3

*Natrii fluoridum* It. A, B, C, Informative test: 1


week 6


*Natrii carbonas decahydricus* It. A, B, C, Pt. Appearance of solution, Alkali hydroxides and bicarbonates, Chlorides, Sulphates, Arsenic, Heavy metals, Informative test: 1, 2

*Kalii hydrogenocarbonas* It. A, B

*Kalii carbonas* It. A, B, Informative test: 2, 3

*Lithii carbonas* It. A, B, C, Assay, Informative test: 3

Seminar: Mercury compounds, iron and iron compounds, mangan, calcium, magnesium and barium compounds, mercury(I) chloride, *Hydrargyri chloridum, Cupri sulfas, Argenti nitras, Ferrum ad praeparationes homoeopathicae, Ferrosi sulfas, Ferri;
Curriculum 2007/2008

Chloridum, Mangani sulfas, Kalii permanganas, Calci chloride, Calci carbonas, Calci hydroxidum, Calci sulfas, Mangesii subcarbonas levis, Magnesii chloride, Magnesii oxidum leve, Magnesii peroxidum, Magnesii sulfas, Barii sulfas.

Week 7

Natrii thiosulfas It. A, B, C, D, Pt. Sulphates and sulphites, Sulphides, Assay, Informative test: 1, 3

Natrii metabisulfis It. B, C, Pt. Appearance of solution, Thiosulphatese, Informative test: 1

Kalii sulfas It. A, B

Natrii sulfas It. A, B, Pt. Appearance of solution, Acidity or alkalinity, Chlorides, Calcium, Heavy metals, Iron, Magnesium, Informative test: 1, 3

Calci sulfas Dihydratus It. B, C

Written test on the subject of week 1-6.

Week 8

Acidum boricum It. A, B, Pt. Organic matter, Assay

Borax It. A, B, C, Pt. Appearance of solution, Ammonium, Arsenic, Calcium, Heavy metals, Informative test: 1

Natrii nitris It. A, B, C, Informative test: 1, 3

Kalii nitris It. A, B, Informative test: 2, 3

Sulfur ad usum externum It. A, B, Pt. Appearance of solution, Odour, Acidity or alkalinity, Chlorides, Sulphates, Sulphides


Week 9

Carbo activatus It. A, B, Pt. Acidity or alkalinity, Alkali-soluble coloured substances, Sulphides, Adsorption power, Informative test: 2

Arseni trioxidum ad praeparationes homoeopathicae It. A, B

Dinatrii phosphas dodecahydratus It. A, B, Informative test: 1, 3

Natrii hydrogenophosphas dihydricus It. A, B, C, Pt. Appearance of solution, Reducing substances, Informative test: 2, 3

Calci hydrogenophosphas dihydricus It. A, B, Pt. Carbonates, Chlorides, Sulphates, Arsenic, Barium, Iron, Heavy metals, Informative test: 1, 3

Silica colloidalis hydrica It. A, Informative test: 1, 2, 3

Seminar: Pharmaceutical periodicals and manuals, literature. Study of the pharmaceutical literature by traditional methods and computer.

General anaesthetics: Aether, Chloroformium, Halothanum (Narcotan), isoflurane (Forane), thiopental (Trapanal)

Sedatohypnotics: Chloralhydratum, Carbromalum, Barbitalam, Phenobarbitalum (Sevenal), Hexobarbitalum (Novopen), Glutethimidum (Noxyron), thalidomid (Contergan), Nitrazepamum (Eunoctin), Midazolamum (Dormicum)

Treatment of alcoholism: Disulfiramum (Antaethyl)

Week 10

Ferrum ad praeparationes homoeopathicae It. A, Pt. Sulphides and phosphides, Assay

Ferri chloride hexahydratus It. A, B, Pt. Free chloride, Ferrous ions, Informative test: 1

Ferrosi sulfas heptahydricus It. A, B

Magnesii sulfas heptahydricus It. A, B

Magnesii subcarbonas levis It. A, B, C, Pt. Appearance of solution, Chlorides, Sulphates, Arsenic, Calcium, Iron, Informative test: 1

Seminar:

Antiepileptics: Phenobarbitalum (Sevenal), Primidonum (Sertan), Phenytoinum (Diphepan), etosuximid (Petoxid), clonazepam (Rivotril), carbamazepine (Stazepeine, Tegretol), lamotrigin (Lamictal), valproic acid (Convulex)

Neuroleptics: Chlorpromazinum hydrochloricum (Hiberal), chlorprotixen (Truxal), Haloperidolum, risperidonum (Risperdal), Clozapinum (Leponex), olanzapin (Zyprexa)

Anxiolytics: Chlordiazepoxidum (Librium), Diazepamum (Valium), medazepam (Rudotel), alprazolam (Xanax), tofizopam (Grandaxin), meprobamate (Andazin), buspiron (Anxiron), Trimetozinum (Trioxazin)

Week 11

Kalii permanganas It. A, B, Assay

Mangani sulfas monohydricus It. A, B
Magnesii trisilicas  It. A, B, Informative test: 1, 2, 3
Magnesii oxidum leve  It. A, B, Pt. Appearance of solution, Chlorides, Sulphates, Arsenic, Calcium, Iron, Informative test: 1, 3)
Zinci oxidum  It. A, B, Pt. Alkalinity, Carbonates and substances insoluble in acids, Assay
Zinci sulfas heptahydricus  It. A, B

Seminar:
Opioid analgesics and antagonists: Morphinium chloratum, Aethylopharmhini hydrochloricum, Pethidini hydrochloricum (Dolargan), Methadoni hydrochloricum (Depridol), Nalorphinium bromatum
Antidepressants: Imipramini hydrochloricum (Melipramin), Amitriptilini hydrochloricum (Teperin), fluoxetine (Prozac), sertaline (Zoloft)
Antiparkinson agents: levodopa (Dopaflex), amantadine (Viregyt-K), Apomorphini hydrochloricum, selegiline (Julmes), procyclidin (Kemadrin)
Muscle relaxants: Pipiceruni hydrobromidum (Arduan), Baclofenum (Lioresal), Carisoprodulum, Tolperisone (Mydogin)

week 12
Bismuthi subnitras ponderosus  It. A, B, C, Assay, Informative test: 2
Alumen  It. A, B, C, Informative test: 1
Aluminii sulfas  It. A, B, Pt. Appearance of solution, Ammonium, Iron, Heavy metals, Informative test: 1
Barii sulfas  It. A, B,
Titanii dioxidum  It. A, Informative test: 2, 3
Hydargyri dichloridum  It. A, B
Argenti nitras  It. A, B
Cupri sulfas pentahydricus  It. A, B, Assay

Written test on the subject of week 7-12

week 13
Identification of 10 unknown compounds.

Seminar
Psychomotor Stimulants: Amphetamine, Caffeine
Hallucinogens and illegal drugs: coca, heroin, LSD, tetrahydrocannabinol (THC), MDMA (Ecstasy)
Anorectics: Mazindole (Teronac), Sibutramin (Reductil)
Anti-Migrain Agents: Sumatipran (Imigran), Pizotifen (Sandomigran)
Nootropics: Piracetam (Nootropil)
Local anesthetic agents: cocaine, benzocaine, procaine, lidocaine, bupivacaine (Bucain, Marcin)
Spasmolytics: papaverine, drotaverine (No-Spa), bencyclane (Halidor)

week 14
Supplementary practice. Accounting with the laboratory equipment.

6th semester

LECTURES

Cholinergic and adrenergic drugs and related agents
Parasympathomimetics
Direct parasympathomimetics, Acetylcholine, Carbachol, Pilocarpine, Muscarine, Arecoline.
Indirect parasympathomimetics, Phystostigmine, Neostigmine, Pyridostigmine, Ecothiopate.
Irreversible AChE inhibitors, Paraoxon, Parathion, Methylparathion.
Cholinesterase reactivators.

Parasympatholytics

Sympathomimetics
α-Sympathomimetics, Norepinephrine, Epinephrine, Oxedrine, Phoedrine.
β-Sympathomimetics, Isoprenaline, Bamethane, Terbutaline, Salbutamol, Naphazoline.
Ephedrine, Pseudoephedrine, Structure elucidation, Synthesis, Steric structure, conformation.
Sympatholytics
α-Sympatholytics, Ergot alkaloids, Analysis of ergot alkaloids, Ergotamine, Ergometrine.
LSD
Tolazoline, Phentolamine, Prazosine.

β-Sympatholytics. Oxprenolol, Pindolol, Propranolol, Metoprolol.

Local Anaesthetic Agents
Cocaine, Steric structure of cocaine.
Benzocaine, Procaine, Tetracaine, Lidocaine, Cinchocaine.

Smooth muscle active drugs

Spasmolytics
Papaverine, Synthesis of papaverine, Ethaverine, Drotaverine, Moxaverine, Bencyclane, Further synthetic spasmyotics.
Antiangular agents and vasodilators
Nitrates and nitrates. Amyl Nitrite, Nitroglycerine, Pentaisythritol Tetranitrate, Isosorbide Dinitrate, Nicotinic Acid, Xantinol Nicotinate, Nicotinamide.


Selective calcium blocking antagonists. Verapamil, Nifedipine.

Cardiovascular drugs

Antiarrhythmic agents
Steric structures of quinine and quinidine, Quinidine, Procainamide, Lidocaine.

Antihypertensive agents
Reserpine
Drugs acting directly on smooth muscle. Diazoxide, Dihydralazine, Clonidine
Angiotensin-converting enzyme inhibitors, and adrenergic blockers. Captopril, Methyldopam, Parglyline.
Calcium channel blockers. Verapamil, Nifedipine, Nitrendipine, Preynylamine, Fendiline, Lidoflazine.
Cerebrotonics. Cinnarizine, Vincamine, Vinpocetine.

Antihyperlipidaemic agents. Clofibrate, Pyricarbate, Nicotinic Acid.

Blood coagulation drugs

Anticoagulants
Heparin Sodium, Dicoumarol, Acenocumarol, Warfarin Sodium, Phenindione.

Haemostatics
Aminocaproic Acid, p-Aminomethylbenzoic Acid, Vitamin K.

Diuretics

Purines and related heterocyclic compounds. Theophylline, Aminophylline, Ethyphylline, Theobromine, Caffeine.
Mercurials. Mercamphamide, Mercuryphyllyne.
Sulphonamides, Benzo-Thiadiazines. Acetazolamide, Chlorothiazide, Hydrochlorothiazide.

High-ceiling diuretics. Furosemide, Etacryninc acid, Clopamide, Chlortalidone.

Endocrine antagonists. Spironolactone
Osmotic agents. Sorbitol, Mannitol.

Vitamins

Fat-soluble vitamins. Vitamin A, Ergocalciferol, Cholecalciferol, Vitamin E, Vitamin K.
Water-soluble vitamins. Ascorbic Acid, Synthesis and analysis of Ascorbic Acid, Thiamine Hydrochloride, Riboflavin, Niacinamide, Pantothetic Acid, Pyridoxine, Biotin, Folic Acid, Vitamin B12.

Hormones

Sex hormones and analogues
Androgens. Testosterone, Methyltestosterone.
Oestrogens. Oestrone, Oestradiol, Ethinyl oestradiol, Mestranol, Dienestrol, Diethylstilbestrol.

Antioestrogen. Clomifen.

Progestins. Progesterone, Norgestrel.

Adrenocortical hormones. Corticotropin.

Sulphonamides
Chemistry of sulphonamides, Structure-Activity relationship, Sulphacetamide, Sulphapyridine, Sulphamethoxazole, Sulphapyridine

Antibiotics
History of antibiotics. Groups of antibiotics.

Penicillins. Structure of penicillins, Ampicillin, Benzylpenicillin, Phenoxymethylpenicillin, Carbenicillin, Methicillin, Mezlocillin, Oxacillin.

Cephalosporins. Structure of cephalosporins, Classes of cephalosporins, Cephalexin, Cefamandole, Cefuroxime, Cefaclor.

Tetracyclines. Structure of tetracyclines, Tetracycline, Oxytetacycline, Doxycycline.

Chloramphenicol
Amino acids, Proteins, Enzymes and Peptide Hormones

Amino acids. Naturally occurring amino acids, Aminoacetic acid, Methionine, Dihydroxyaluminium aminoacetate, Aminocaproic acid, Acetylcysteine, Levodopa, Carbidiopa, Glutamic acid.


Enzymes. Relation of structure and function, Classification, Pepsin, Pancreatin, Trypsin, Chymotrypsin, Papain, Hyaluronidase.

Peptide Hormones

Pituitary hormones. Adrenocorticotropic Hormone
Enkephalins and endorphins
Placental hormones. Oxytocin, Vasopressin.
Pancreatic hormones. Insulin, Insulin preparations.
Plasmakinins. Bradykinin, Kallidin.

Practicals

week 1

Seminar:
Psychomotor stimulants: Amphetamine, Caffeine
Hallucinogens and illegal drugs: Cocaine, heroin, LSD, Tetrahydrocannabinol (THC), MDMA (Ecstasy)
Anoretics: Sibutramin (Reductil)
Anti-Migrain Agents: Sumatipran (Imigran)
Nootropics: Piracetam (Nootropil)
Local anesthetic agents: Cocaine, Benzocaine, Procaine, Lidocaine, Bupivacaine (Bucain, Marcain)
Spasmylytics: Papaverine, Drotaverine (No-Spa), Bencyclane (Halidor)

week 2
Trometamolum (Identification: A; Tests: Appearance of solution, pH, Chloride, Heavy metals, Iron; Assay; Informative test: 3)
Ureum (Identification: C, D; Tests: Appearance of solution, Alkalinity, Biuret, Ammonium, Heavy metals)
Phenolphthaleinum (Identification: B)
Vanillinum (Identification: D)

Seminar:
Parasympathomimetics: Acetylcholine, Carbachol, Pilocarpine (Humacarpin), Physostigmine, Neoostigmine methylsulphate (Stigmosan)
Parasympatholytics: Atropine, Homatropine, Methylhomatropine bromide, Scopolamine, Propantheline bromide, Tropicamide (Mydram)
Cholinesterase reactivators: Pralidoxime
Sympathomimetics: Epinephrine, Isoprenaline (Isuprel), Oxedrine (Sympathomim), Phenylephrine, Ephedrine (Epherit), Naphazoline, Xylomethazoline (Novorin)

week 3
Aether (Tests: Acidity, Substances with a foreign odour, Aldehydes, Peroxides)
Barbitalum (Identification: D; Tests: Acidity; Informative test: 4)
Hexobarbitalum (Identification: D)
Phenobarbitalum (Identification: D; Tests: Acidity; Informative test: 4)
Phenobarbitalum natricum (Identification: D, E; Informative test: 1)
Natrii acetis trihydricus (Identification: A, B; Tests: Appearance of solution, pH; Reducing substances, Chloride, Sulphate, Arsenic, Heavy metals, Iron; Informative test: 2, 3)
Chloraminum (Identification: A, B, C, D, E; Assay)

Seminar:
Sympathomimetics: Prazosine (Minipress), Propranolol (Huma-pronol), Atenolol (Blokium), Metoprolol (Betaloc), Pindolol (Visken)
Antiasthmatic drugs: Theophylline, Salbutamol (Buventol), Terbutaline (Bricanyl)
Antiarrhythmic drugs: Quinidine, Lidocaine, Amiodarone (Cordarone)
Digitalis and other cardiac glycosides: Digitoxin (Digimerck)
Xantin derivatives: Theobromine, Theophylline, Caffeine
**Antiemetics:** Ondansetron (Zofran), Dimenhydrinate (Daedalon)

**Anticoagulants and haemostatics:** Acenocoumarol (Syncumar), Ticlopidine (Ticlid)

**week 4**

*Ethanol*um (Identification: C, D; Tests: Appearance, Acidity, alkalinity; Informative test: 2)

*Alcohol isopropyllicus* (Identification: C; Tests: Peroxides)

*Apomorphini hydrochloridum* (Identification: C; Informative test: 3, 4)

*Codeini hydrochloridum dihydricum* (Identification: C, D, E; Informative test: 4)

*Ethylmorphini hydrochloridum* (Identification: C, D; Informative test: 4)

*Morphini hydrochloridum* (Identification: C, D, E, F, G)

*Calcii gluconas* (Identification: B; Tests: Appearance of solution, Sucrose and reducing sugars, Chloride; Assay; Informative test: 1, 2, 3)

*Chlorali hydras* (Identification: A, B; Tests: Appearance of solution, pH; Chloral alcoholate, Chloride, Heavy metals; Assay)

**Seminar:**

**Antihypertensive agents:** Methyl dopum (Dopegyt), Captopril (Tensiomin), Enalapril (Ednyt), Losartan (Cozaar), Guanfacin (Estulic), Moxonidine (Cynt)

**Antianginal agents and Ironodilators:** Glyceril trinitrate (Nitromint), Pentaerythritol tetranitrate (Nitropenton), Isosorbide mononitrate (Cardisorb, Rangin), Nicotinic acid, Pentoxyfilline (Trental)

**Antihyperlipidaemic agents:** Lovastatin (Mevacor), Phenofibrate (Lipanthyl, Lipidil)

**Calcium channel blockers:** Nifedipine (Corinfar), Nitrendipine (Baypress), Verapamil (Isoptin), Diltiazem (Blolocalin)

**Agents improving cerebral circulation:** Vinpocetine (Cavinton), Cinnarizine (Stugeron)

**week 5**

*Benzocainum* (Identification: C, D; Informative test: 3)

*Cocaini hydrochloridum* (Identification: D, E; Informative test: 4)

*Lucocaini hydrochloridum* (Identification: D, E, F; Tests: A-Impurity; Informative test: 3)

*Procaini hydrochloridum* (Identification: C, D, E, F; Informative test: 3, 4)

*Tetracaini hydrochloridum* (Identification: B, C, D; Informative test: 2)

*Acidum asparticum* (Identification: B; Tests: Appearance of solution, Chloride, Sulphate, Ammonium; Assay; Informative test: 2, 3)

*Glycerolum (85 per centum)* (Identification: C, D; Assay)

**Seminar:**

**Antitussiv agents:** Codeine, Noscapine, Butamirate (Sinecod), Prenoxdiazine (Libexin)

**Mucolytics:** Bromhexine (Paxiraso1), Ambroxol (Halixol), Terpin, Acetylcysteine (ACC, Fluimucil)

**Drugs of osteoporosis prevention:** Clodronic acid (Bonefos)

**Drugs for gout:** Allopurinol (Milurit)

**Thyroid and antithyroid drugs:** Levothyroxine (Euthryox), Liothyronin, Thiamazole (Metothyrin), Propylthiouracil (Propycil)

**Antidiabetetics:** Glibenklamide (Gilemal), Buformine (Adebit)

**Artificial sweeteners:** Saccharin sodium, Aspartame (Nutrasweet)

**Mono- and disaccharides:** Fructose, Glucose, Lactose, Sucrose

**week 6**

*Atropini sulfas* (Identification: D, E, F; Informative test: 3)

*Homatropini hydrobromidum* (Identification: C, D; Informative test: 3)

*Physostigmini salicylas* (Identification: C, D)

*Pilocarpini hydrochloridum* (Identification: D, E)

*Ephedrini hydrochloridum* (Identification: D, E)

*Isoprenalinii hydrochloridum* (Identification: D, E)

*Papaverini hydrochloridum* (Identification: D; Informative test: 2)

*Natrii edetas* (Identification: B, C, D; Assay; Informative test: 3)

*Methenaminum* (Identification: B, C, D; Tests: Appearance of solution, Acidity, alkalinity, Free formaldehyde, Chloride, Sulphate, Ammonium, Heavy metals; Informative test: 1)

**Written test** on the subject of week 1-6.
week 7

Acidum **acetylsalicylicum** (Identification: B, C, D; Assay; Informative test: 1)

Acidum **salicylicum** (Identification: C; Informative test: 2, 3)

Methylis **parahydroxybenzoas** (Identification: D; Informative test: 2, 3)

**Phenazonum** (Identification: C, D; Tests: Appearance of solution, Acidity, Alkalinity, Chloride, Sulphate, Heavy metals; Assay; Informative test: 4)

**Phenylobutanonum** (Identification: D; Informative test: 1, 2)

**Paracetamolum** (Identification: D, E)

**Indometacinum** (Identification: D, E)

**Seminar:**

**Drugs used in stomac disease:** Phenolphthalein, Dehydrocholic acid, Diphenoxylate, Loperamide (Imodium), Metoclopramide (Cerucal), Cimetidine (Histodil), Ranitidine (Ulercan, Zantac), Omeprazole (Losec)

**Diuretics:** Acetazolamide (Huma-Zolamide), Furosemide (Furon), Hydrochlorothiazide (Hypoziad), Etacrylic acid (Uregyt), Amiloride, Spironolactone (Verospiron), Sorbitol

**Antiallergic antihistamins:** Promethazine (Pipolphen), Dimenhydrinate (Daedalon), Dimethindene (Fenistil), Cetirizine (Zyrtec), Loratadine (Claritine)

week 8

Acidum **ascorbicum** (Identification: D; Assay; Informative test: 2)

**Nicotinamidum** (Identification: C, D)

**Riboflavinum** (Identification: C)

**Thiamini hydrochloridum** (Identification: B, C; Informative test: 2)

**Cholesterolum** (Identification: C; Informative test: 1)

**Prednisolonum** (Informative test: 1)

Acidum **citricum monohydricum** (Identification: A, C, D; Tests: Appearance of solution, Oxalic acid, Sulphate, Heavy metals; Informative test: 3)

**Natrii citras** (Identification: A, B; Tests: Appearance of solution, Acidity, Alkalinity, Chloride, Oxalates, Sulphate, Heavy metals; Assay; Informative test: 2, 3)

**Seminar:**

**Nonsteroidal analgesics and antipyretics:** Salicylic acid, Acetylsalicylic acid (Aspirin), Paracetamol (Rubophen), Phenacetin, Aminophenazon, Propiphenazon, Metazol sodium (Algopryn)

**Nonsteroidal antiinflammatory agents:** Phenylobutazone, Etofenamate (Rheumon), Nifluminic acid (Donalgin), Indometacin, Diclofenac (Voltaren, Cataflam), Ibuprofen (Solpaflex, Advil), Naproxen (Naprosyn, Aleve), Piroxicam (Hotemin, Feldene)

**Antinflammatory steroids:** Hydrocortisone, Prednisolone, Triamcinolone acetonide (Ftorocort), Flucinolone acetonide (Flucinar), Betamethazone (Diprophos), Dexamethasone (Oradexon), Beclomethasone (Aldecin), Budesonide (Pulmicort), Mazinepredone

week 9

**Coffeinum** (Identification: C, D, F; Informative test: 3)

**Theobrominum** (Identification: B, C; Tests: Acidity; Informative test: 3)

**Theophyllinum** (Identification: C, E; Tests: Appearance of solution, Acidity; Assay; Informative test: 3)

Acidum **tartaricum** (Identification: A, C, D; Tests: Appearance of solution, Oxalic acid, Sulphate, Heavy metals; Informative test: 3)

**Bismuthi subsalicylas** (Identification: A, B; Tests: Appearance of solution, Oxalic acid, Chloride, Sulphate, Calcium)

**Bismuthi subgallas** (Identification: A, B; Tests: Chloride, Nitrate; Assay; Informative test: 1)

**Seminar:**

**Antifungal agents:** Clotrimazole (Canesten), Tolnaftate (Chinofungin), Terbinafine (Lamisil), Ketoconazole (Nizoral), Fluconazole (Difucan)

**Drugs used in the chemtoherapy of helminthiasis:** Levamisole (Decaris), Mebendazole (Vermox)

**Antimalarial agents:** Quinine, Chloroquine (Delagil), Mefloquine (Lari am), Pyrimethamine

**Antiseptics and desinfectans:** Chlorogenium, Methenamine

**Microbiological preservatives:** Methyl (p-hydroxy benzoate)

**Chemotherapic siflonamides:** Sulfacetamide, Sulfadimidine, Sulfamethoxazole, Sulfasalazine (Salazopyrin)

**Chemotherapic nitrocompounds:** Nitrofurantoin, Metronidazole (Klion)

**Other chemotherapic compounds:** Trimethoprin, Nalidixic acid (Nevigramon)
Fluoroquinolon derivatives: Ciprofloxacin (Ciprobay), Ofloxacin (Tarivid)

Antituberculotics: Isoniazid (Isonicid), Pyrazinamide, Ethambutol (Sural), Cycloserine

week 10

Saccharinum natricum (Identification: C, D, E; Informative test: 1)

Fructosum (Identification: B, C, D)

Glucosum anhydricum (Identification: C; Tests: Appearance of solution, Acidity, Alkalinity, Foreign sugars, soluble starch, dextrins, Chloride, Sulphate, Arsenic, Barium, Calcium; Informative test: 2)

Lactosum monohydricum (Identification: C; Informative test: 2)

Sorbitolum (Tests: Reducing sugars; Informative test: 2)

Saccharum (Identification: C; Tests: Appearance of solution, Acidity, Alkalinity, Dextrin, Glucose and invertsugars)

Formaldehydi solutio (35 per centum) (Identification: A, B, C; Tests: Appearance of solution, Acidity; Assay)

Seminar:

Sex hormones and analogues: Oestradiol, Oestrone, Ethinyl oestradiol, Clomifen (Clostilbegyt), Testosterone (Andriol), Landrolol (Retabolil), Progesterone, Ethinodiol diacetate, Levonorgestrel

Nonsteroidal agents acting on sexual activity: Sildenafil (Viagra), Apomorphine (Uprima)

Vitamins: Retinol (vitamin A), Ergocalciferol (vitamin D), Cholecalciferol (vitamin D), Menadione (vitamin K), Thiamine chloride (vitamin B), Riboflavin (vitamin B), Pyridoxine (vitamin B), Nicotinamide, Folic acid, Ascorbic acid (vitamin C)

week 11

Phenolum (Identification: A, B, C)

Resorcinolum (Identification: B, C; Tests: Appearance of solution, Acidity, Alkalinity, Pyrocatechol; Assay)

Thymolum (Identification: C, D)

Acidum benzoicum (Identification: B; Tests: Oxidisable substances; Assay; Informative test: 1, 2)

Natrii benzoas (Identification: A, B; Tests: Appearance of solution, Acidity, Alkalinity; Informative test: 2, 3)

Seminar:

Antiviral agents: Amantadine, Acyclovir (Zovirax), Ribavirin (Copegus, Rebetol), Nevirapine (Viramide)

Antibiotics: Benzylpenicillin, Ampicillin (Semicillin), Amoxicillin (Aktii), Oxacillin, Imipenem (Tienam), Sulbactam, Clavulanic acid, Cephalixin (Pyassan), Cefuroxime (Zinacef, Zinnat), Chloramphenicol, Doxycycline (Tenutan)

Antineoplastic agents: Cyclophosphamide (Cytoxan), Cisplatin (Platidiam), Carboplatin (Cycloplatin), Fluorouracil (Efudix), Methotrexate (Trexan), Imatinib (Glivec)

Drugs used for immunomodulation: Levamisole, Azathioprine (Imuran)

week 12

Chloramphenicolum (Identification: D, E; Informative test: 1)

Oxytetracyclini hydrochloridum (Identification: B, C; Informative test: 2)

Sulfadimidinum (Identification: C, D; Informative test: 1)

Chinidini sulfas (Identification: B, C; D, E, F; Tests: pH; Informative test: 1, 3, 4)

Chinini sulfas (Identification: B, C, D, E; Tests: pH; Informative test: 1, 3, 4)

Acidum lacticum (Identification: A, C; Tests: Appearance, Sugars and other reducing substances, Citric, oxalic and phosphoric acids, Sulphate, Calcium, Heavy metals; Assay; Informative test: 3)

Written test on the subject of week 7-12.

week 13 and 14

Identification of 10 unknown compounds.

Supplementary practice. Accounting with the laboratory equipment.
PHARMACEUTICAL TECHNOLOGY

5th semester

LECTURES

Pharmaceutical technology 1

Introduction to Pharmaceutical Technology I, General considerations
Pharmaceutics
  Biopharmaceutics
  Classification of technological operations
  Types of dosage forms
  Quality for pharmaceutical products

Introduction to Pharmaceutical Technology II
  Preformulation, formulation
  Drug formulation by neural network and factorial design

Normatives in pharmaceutical technology
  GMP, ISO
  Validation, qualification
  Basics of industrial drug formulation

Physico-chemical basics of pharmaceutical technology, theory and practice
  Interfacial phenomena
  Surface and interfacial phenomena
  Adsorption
  Adhesion
  Electrokinetic processes

Rheology in pharmaceutical technology
  Concept of rheology
  Classification of rheological processes
  Rheology of disperse and coherent systems

Connection between the pharmaceutical technology and the technical chemistry
  Water purifying methods
  Distillation
  Ion exchanging
  Reverse osmosis
  Seawater desalination

Excipients in pharmaceutical technology
  Classification of excipients
  Dosage forms and excipients

Liquid dosage forms
  Grouping
  Physicochemical characteristics
  Stability problems
  Biopharmaceutical considerations

Emulsions and suspensions
  Types and stability
  Administration routes
  Excipients

Liposomes
  Types and stability
  Administration routes

Powders
  Particle size, distribution
  Mixing

Extraction of plants
  Methods and equipment
  Types
6th semester

LECTURES

Pharmaceutical technology 2

Aerosols and Inhalasols
- Types and stability
- Administration routes
- Preparations

Theory and practice of sterilization
- Theory of sterilization
- Methods
- Control of sterilizing

Aseptic dosage forms
- Requirements of parenteral preparations
- Clean air technology
- Application routes
- Excipients
- Containers
- Elements of homeostasis
- Tests for pyrogens
- Dosage forms
- Industrial methods

Microbiological preservation of liquid dosage forms
- Requirements of preservatives
- Efficacy of preservatives
- Preservatives

Ophthalmic dosage forms
- Eye drops
- Eye cleaning solutions

Semisolid dosage forms
- Classification of dermatological preparations
- Types of ointment bases
- Production of ointments
- Investigation of ointments
- Choice of ointments, therapeutic and practical considerations

Gels
- Polymers in pharmaceutical technology
- Hydrogels
- Stimuli responsive hydrogels

Nasal drug delivery systems
- Basic concepts of administration
- Factors affecting bioavailability
- Dosage forms and excipients

Rectal and vaginal dosage forms
- Therapeutic considerations
- Dosage forms
- Additives

Granulation and granules
- Types of granules
- Particle binding mechanisms
- Methods of granulation
- Investigation of granules

Pressing of solid particles, compressibility and process
- Tablet compression
- Tablet compression machinery
- Compressibility and its measurement

Tablet making and texture of tablets
- Development of solid dosage forms
- Methods
- Excipients
Characteristics of texture
Preformulation tests
Tests of tablets
Influencing factors on the physical parameters
Problems during tableting
Equipment for the tablet making

PRACTICALS

Prescription pharmacy 1

General instruction
Rules of measuring
Dispensing of solutions
“A” measuring of liquids
“B” measuring of powders
Writing of prescriptions
Liquid dosage forms
Solutio
Diluentem, aqua aromatica, gargarisma, elixírium, mixtura, sirupus, klysma
Solubility, right order of dissolving, dilution, calculation
Solvents, excipients
Calculation

Solutio acriflavini (FoNo VII. 20,0 g)
Solutio contra rhagades mamillae(FoNo VII. 33,6 g)
Gargarisma chlorogenii (FoNo VII. 100,0 g)
Sirupus zinci (FoNo VII. 100,0 g)
Solutio noraminophenazoni pro parvulo (FoNo VII. 100,0 g)
Mixtura pectoralis (FoNo VII. 100,0 g)
Solutio pepsini (FoNo VII. 100,0 g)
Magistral preparation (50,0g)
Mixtura solvens (FoNo VII. 100,0 g)
Gutta, Klysma
Checking the dose
Otogutta, nasogutta
Dilutio, trituration
Gutta methylhomatropini composita (FoNo VII. 10,0 g)
Otogutta peroxydi (FoNo VII. 10,0 g)
Klysma chlorali pro infante (FoNo VII. 80,0 g)
Nasogutta zinci cum ephedrino (FoNo VII. 10,0 g)
Solutio theophyllini (FoNo VII. 100,0 g)
Solutio nephrolitica (FoNo VII. 100,0 g) Incompatibility
AUV preparations
Oily and alcoholic solutions
Incomp II (sol. 150,0g)
Otogutta fungicida (FoNo III Vet)
Solutio metronidazoli (FoNo VII. 30,0g)
Spiritus iododalicylatus (FoNo VII. 30,0g)
Self-made preparation
Incomp I (gutta 20,0g)
Oleum pro inhalatione (FoNo VII. 20,0g)
Gutta antipyretica (FoNo Vet. III. 100,0g)

Galenic Practice

Introduction
Functions of a galenic pharmacy
Galenic preparations of the Pharmacopoea
Calculations
Dosage form investigations of the Pharmacopoea (Ph.Eur., USP, Br.Ph.)
Quality control, Operation methods, Production sheets
Safety precaution, fire protection, material safety data sheets

**Measurement of mass, balances**
- Definitions, types, general rules
- **Mechanical balances:**
  - mass-comparative balances: equal arm balances (Berkel), unequal-arm balances (OWA, Metripond, cg quick balance); deformation principles balances (coil, spiral and bent spring);
  - Electronic (strain-gauge) balances: advantages, different functions, types (analytical, precision and industrial platform balances, moisture analyser balance), adjusting/calibration (inner, external).

**Separation methods:**
- **Distillation:** definition, parts, sets of operation/material/heating, laboratory distillator, thermocompression, products;
- **Ion-exchange/demineralization:** theory, synthetic resins, capacity, process, products;
- **Reverse osmosis (RO):** theory, RO membrane, process, product;
- **Centrifugation:** definition, factors, alignment, parts, types of rotors (e.g. swing-out rotor, angle rotor).

**Desintegration**
- Crushing, pulverization: definitions, working principle, efficiency of crushing, crushers (Jaw, gyratory) grinders (roller and hammer);
- Process of milling: mills (mortar and pestle, ball, vibratory ball, centrifugal ball, planetary ball, disk, cutting, industrial jet and colloid mill), rotary cone sample divider;
- **Particle size analysis (PSA) and its application:** importance, FDA guide, USP tests, US and UK standard sieves, frequency of distribution, cumulated plots, microscopic measurement, laser diffractometer.

**Homogenization**
- **Mixing:** definition, efficiency, required mixing time, mixing equipments
  - Liquid mixing: paddle, anchor and propeller type, high shear homogenizer, circular flow and turbine mixer, shakers;
  - Mixing of semisolids: planetary mixer, kneaders, dispersers, curved blade impeller;
  - Mixing of solids: cylindric, cubic, tumbler, double cone, twin shell and vertical screw mixers.

**Material transfers**
- **Drying:** definitions, purpose, efficiency, industrial microwave drying, vacuum drying, spray drying (nozzle, atomizer) and its application;
- **Dissolution:** solutions, theory, definitions, expressions of concentration, pharmaceutical applications, dosage form, dissolution rate, formulation;
  - Molecular and colloidal solution (preparation): real solution, stock solution, syrups (medicinal and flavouring), mucilages (polymers), elixirs, spirits, mixtures, aromatic waters, tinctures;
  - Industrial liquid mixing equipments (e.g. double planetary mixer, high-shear rotor-stator mixer, different mixing blades, Powermix and Triple Shaft mixer, disperser), filtering, storage tanks, industrial liquid filling.

**Extraction and extracts**
- definitions, types of process and equipments (maceration, turboextraction, vibroextraction, percolation), dosage forms (preparation, requirements, storage): extracts, tinctures.

**Preparation of disperse systems**
- **Emulsifying:** emulsions, definitions, types, calculation (work-equation, required HLB), industrial manufacturing methods, equipments (mixers, homogenizers, colloid mills, ultrasonic devices), stability;
- **Suspending:** suspensions, definitions, classification, flocculation, industrial manufacturing methods, equipments, kinetics of sedimentation.

**Semisolid dosage forms**
- **Soaps and soap-containing preparations:** definitions, types, preparations (Ph.Hg. and USP);
- **Ointments, creams, pastes, hydrogels:** definitions, classifications, requirements, types of ointment bases, industrial production of semisolid preparations, laboratory (LUX, Erweka, Sabaria) and industrial mixers (e.g. counter-rotating paddle agitator), pastes, three-roll apparatus, penetrometric examination;
- **Suppositories:** definitions, types, types and preparation of suppository bases, laboratory and industrial preparation of suppositories (suppository moulding equipments), types of moulds (metal, plastic), form-fill-seal.
# PATHOPHYSIOLOGY

5th semester (15 weeks)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE (2 hrs/week)</th>
<th>SEMINAR (2 hrs/week)</th>
<th>PRACTICE (2 hrs/week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Inflammation</td>
<td>Normal ECG. Review of physiologic background.</td>
<td>ECG leads. Registration of ECG.</td>
</tr>
<tr>
<td>2.</td>
<td>Congenital heart diseases</td>
<td>Inflammation</td>
<td>ECG leads. Registration of ECG</td>
</tr>
<tr>
<td>5.</td>
<td>Angina pectoris, myocardial infarction, sudden ischemic death</td>
<td>Changes in plasma lipoproteins. Atherosclerosis</td>
<td>ECG: atrial and ventricular preexcitation (ES)</td>
</tr>
<tr>
<td>6.</td>
<td>Hypertension, hypotension</td>
<td>Angina pectoris, myocardial infarction, sudden ischemic death</td>
<td>ECG: angina, myocardial infarction</td>
</tr>
<tr>
<td>7.</td>
<td>Syncope, shock</td>
<td>Hypertension, hypotension</td>
<td>ECG: atrial fibrillation, ventricular fibrillation and flatter</td>
</tr>
<tr>
<td>9.</td>
<td>AUTUMN BREAK</td>
<td></td>
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</tr>
<tr>
<td>10.</td>
<td>Pathophysiology of salt-water balance II.</td>
<td>Pathophysiology of salt-water balance I.</td>
<td>ECG: Left and right bundle branch (Tawara) block</td>
</tr>
<tr>
<td>11.</td>
<td>Pathophysiology of kidney diseases I.</td>
<td>Pathophysiology of salt-water balance II.</td>
<td>ECG: Electrolyte abnormalities and ECG</td>
</tr>
<tr>
<td>12.</td>
<td>Pathophysiology of kidney diseases II.</td>
<td>Pathophysiology of kidney diseases I.</td>
<td>Investigation of urine samples and renal function</td>
</tr>
<tr>
<td>13.</td>
<td>Obstructive pulmonary diseases. Hypoxias</td>
<td>Pathophysiology of kidney diseases II.</td>
<td>Investigation of urine samples and renal function</td>
</tr>
</tbody>
</table>
### 6th semester (15 weeks)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE (3 hrs/week)</th>
<th>SEMINAR (2 hrs/week)</th>
<th>PRACTICE (2 hrs/week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Immunology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Pathophysiology of white blood cell disorders</td>
<td>Immunology</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Anemias and other red blood cell diseases</td>
<td>Pathophysiology of white blood cell disorders</td>
<td>Determination of wbc, rbc, platelet, eo, reticulocyte count Staining of blood smear and analysis.</td>
</tr>
<tr>
<td>4.</td>
<td>Thrombocyte dysfunction. Patophysiology of hemostasis</td>
<td>Anemias and other red blood cell diseases</td>
<td>Determination of wbc, rbc, platelet, eo, reticulocyte count Staining of blood smear and analysis.</td>
</tr>
<tr>
<td>5.</td>
<td>Gastroenterology (upper GI tract)</td>
<td>Thrombocyte dysfunction. Patophysiology of hemostasis</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Gastroenterológia (colon and pancreas)</td>
<td>Gastroenterology (upper GI tract)</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Pathophysiology of liver diseases</td>
<td>Gastroenterológia (colon and pancreas)</td>
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<td>8.</td>
<td>Endocrinology I.</td>
<td>Pathophysiology of liver diseases</td>
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<td>9.</td>
<td>Endocrinology II.</td>
<td>Endocrinology I.</td>
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<td>10.</td>
<td>Starvation and obesity.</td>
<td>Endocrinology II.</td>
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<td>11.</td>
<td>Disturbances of carbohydrate metabolism, diabetes mellitus</td>
<td>Starvation and obesity</td>
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<td>12.</td>
<td>SPRING BREAK</td>
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<td>13.</td>
<td>Musculo-skeletal diseases</td>
<td>Disturbances of carbohydrate metabolism, diabetes mellitus</td>
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<td>14.</td>
<td>Pathophysiology of the CNS.</td>
<td>Musculo-skeletal diseases</td>
<td>ECG: review</td>
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<td>15.</td>
<td>Summary of Pathophysiology</td>
<td>Pathophysiology of the CNS.</td>
<td>ECG: review</td>
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</table>
Immunology

5th semester (15 weeks)

WEEK    LECTURE
        ( 2 hrs/week)

2. Ontogeny of B-cells. Antigen recognition by and activation of B cells.
6. The histocompatibility complex (MHC). Structure of the molecules and functional heterogeneity. Genetic organization. Antigen presentation by MHC.
8. AUTUMN BREAK
10. Immunization against microbes. Vaccination
12. Manufacture of immunological products and their quality control.
13. Immune response to infectious agents.
15. Consultation
Microbiology

5th semester (15 weeks)

WEEK LECTURE (3 hrs/week) PRACTICE (2 hrs/week)
1. Introduction to microbiology
   Classification and characterization of bacteria
   Bacterial structure, growth and nutrition of bacteria
2. Principles and practice of sterilization and disinfection.
   Factory hygiene and good manufacturing practice.
   Microbiological requirements and purity classes of pharmaceutical products.
3. Pharmaceutical products of microbial origin.
   Microorganisms in pharmaceutical industry.
   Microbial genetics.
   Culture media. Inoculation and plating bacterial cultures. Haemoculture, anaerobic cultivation.
   Bacterial resistance to antibiotics. Antibiotic policy. Industrial production of antibiotics.
   Test of bacterial resistance to antibiotics. Enumeration of bacteria.
5. Production of pharmaceuticals by recombinant DNA technology
   Pathogen-host interactions
   Pathogenesis of bacterial infection
   Serological tests I.: Precipitation, agglutination.
6. Streptococcus, Neisseria, Enterococcus, Staphylococcus
6. Gram positive anaerob rods (Clostridium) and B. anthracis
   Gram positive aerob rods (Corynebacterium, Listeria,)
   Sprirochaeta, Mycobacterium.
   Serological tests II.: CFT; IF; RIA, etc. Cell mediated reactions. Serobacteriological products. Vaccines.
7. Gram negative anaerob rods
   (Haemophilus, Bordetella, Legionella).
   Pathogens of zoonoses (Yersinia, Francisella).
   Gram negative rods II.
   Enteric and extraintestinal pathogens.
   Summary of the most important human pathogenic bacteria I.
8. AUTUMN BREAK

9. Gram negative rods I.
   Bacteria related to respiratory tract (Haemophilus, Bordetella, Legionella).
   Pathogens of zoonoses (Yersinia, Francisella).
   Gram negative rods II.
   Enteric and extraintestinal pathogens.
   Serological tests II.: CFT; IF; RIA, etc. Cell mediated reactions. Serobacteriological products. Vaccines.
    Reproduction of viruses.
    Viral pathogenesis, chemotherapy of viral infections.
    Obligate intracellular bacteria (Chlamydia, Coxiella burnetii, R. slovaca, R. prowazekii).
    Summary of the most important human pathogenic bacteria II.
11. DNA viruses I.
    Herpesviruses, human papillomaviruses.
    DNA viruses II.
    Human papovavirus B19, variola and vaccinia virus, adenoviruses.
    Summary of the most important human pathogenic virus.
    RNA viruses I.
    Influenzaviruses, measles-, mumps-, rubeola viruses.
    Summary of the most important human pathogenic bacteria II.
14. Fungi of medical importance. RNA viruses IV.
    Gastroenteritis causing viruses (rota-, calici-, astroviruses). Slow viruses.
    Important human pathogenic fungi.
15. Important human pathogenic helminths.
    Important human pathogenic protozoa and helmints.
BIOPHARMACY

LECTURES

Basic principles
Specific features of drug action. Basic conditions in the interaction between the living organism and the active substances.

Mechanisms and time course of drug elimination
Mean residence time: principle and calculation. Graphical representation.

Drug administration
Extravascular administration. First order absorption, absorption rate constant, absorption half-life. Oral administration of drugs: absorption from various parts of GI tract. Presystemic metabolism. First pass effect and its kinetic consequences. Absorption from lungs and different mucous surfaces (nasal, buccal, vaginal).

Distribution of drugs
Kinetics of drug distribution. Special forms of distribution: penetration into the cerebrospinal fluid, milk and liver. Penetration through the placenta: teratogenetic and foetopathic effect of drugs. Consequences of drug binding to plasma proteins.

Pharmacokinetical model systems

Mathematical models. Model dependent and model independent methods for calculation of kinetic parameters.

Applied biopharmaceutics

Clinical pharmacokinetics and biopharmaceutics
Basic principles and practical conditions in drug monitoring: therapeutical consequences as the basis of clinical biopharmaceutics.
Special pharmacokinetics of some drugs: cardioactive substances, antibiotics, anticoagulants, theophylline, amphetamine, cyclosporine, methotrexate.

PRACTICALS

Distribution and elimination of the drugs
Blood level curve of penicillin after i.v. administration.
Monitoring of drug level by computer program.

Absorption of the drugs
Oral administration of ampicillin. One-compartment kinetic model.

Two-compartment models
Pharmacokinetics of theophyllin.

Kinetics of intravenous infusion
Steady-state lidocaine level by constant infusion.

Bioavailability
Calculation of AUC value. Physiological availability of oxprenolol.

Repeated drug administration
Therapeutic blood level of carbamazepine. Multiple dosage regimens: loading dose and maintenance dose.

Dosage correction in renal impairment
Pharmacokinetic parameters for gentamicin.
Importance of peak and trough concentration of the drug.

Dosage schedule for children and elderly subjects
Calculation of adequate doses for digoxin therapy.

Dosage correction in hepatic dysfunction
Repeated administration of paracetamol.
Increasing doses and limited elimination.

Pharmacokinetics of capacity-limited metabolism
Calculation of phenytoin dose by use of Michaelis-Menten equation.
PHARMACEUTICAL ANALYSIS AND DRUG CONTROL

LECTURES

Instrumental analytical methods are applied for characterization of starting materials and final products, and also for the control of pharmaceuticals and their decomposition products according to pharmacopoeias, together with the metabolites of pharmaceuticals.

- Electrometric methods: voltammetry, polarography, amperometry, potentiometry, conductometry and oscilometry.
- Spectrophotometry, spectrophotometers, atomic and molecular spectra, UV and visible absorption spectrophotometry, chemical structure and qualitative and quantitative determination of pharmaceuticals by spectrophotometry. Spectrofluorometry and IR spectrophotometry. Structure determination and application of IR spectra for qualitative and quantitative purposes. Emission and atomic absorption spectrophotometry and flame photometry.
- Nuclear magnetic resonance spectroscopy (NMR).
- Mass spectrometry (MS) and combinations of gas chromatography and high-pressure liquid chromatography with MS. Field ionization and chemical ionization mass spectrometry.
- Thermoanalytical methods (TG DTA. DTA, DSC).
- Optical rotation (ORD, CD), refraction and molecular refraction.
- X-ray diffraction (XRD). XRD analysis of solid pharmaceuticals and determination of particle size.

Physical methods: density, solubility, viscosity, surface tension, melting range, eutectic temperature, dropping point, congealing point, boiling range, sublimation, flame coloration, residues of drying and ignition, loss on drying, acid-insoluble ash, etc.

Chromatographic methods: adsorption column, partition column, paper chromatography, thin-layer chromatography (TLC), gas chromatography (GC), high-performance liquid chromatography (HPLC), ion-exchange chromatography, molecular sieves, gel permeation (filtration), zone electrophoresis and counter-current distribution.


Methods of drug registration, preclinical requirements, clinical trials (phases I-III), quality control during manufacturing (GMP) and quality control in post-marketing phase.


PRACTICALS

Pulvis neutracisus (FoNo) (a multicomponent divided powder)
Identity tests: frangula bark, sodium, carbonate, bismuth, magnesium.
Assay: bismuth, magnesium.

Pilula somniferens (FoNo)
Identity tests: hexobarbital, phenobarbital, lactose.
Assay: hexobarbital phenobarbital.

Spiritus iodosalicylatus (FoNo)
Identity tests: iodine, potassium, ethanol, iodide, salicylic acid.
Assay: iodine and salicylic acid

Pulvis antidoloricus (FoNo)
Identity tests: ethylmorphine, caffeine, phenacetin, acetylsalicylic acid.
Assay: ethylmorphine, acetylsalicylic acid.

Unguentum hydrargyri amidochlorati (FoNo)
Identity tests: mercury(II) and ammonia, chloride, sorboxethene.
Assay: marcury(II)amidochloride
Suppositorium aminophenazoni (FoNo)
Identity tests: aminophenazone
Assay: aminophenazone

Suppositorium antiemeticum (FoNo)
Identity tests: lidocaine, atropine, caffeine.
Assay: lidocaine, caffeine.

Injectio algopyrini 50%
Identity tests: noraminophenazonium sodium mesilate
Assay: noraminophanazonum natrium mesilicum

Solution theobromiodati (FoNo)
Identity tests: theobromine, sodium, potassium, iodide, salicylic acid.
Assay: theobromine, iodide.

The constituents of the following dosage forms are identified by thin layer chromatography (TLC):

Pulvis asthmalyticus fortis (FoNo)
Pulvis asthmalyticus fortis cum atropino in tablettis (FoNo)
Antineuralgica tablet
Barbamid tablet
Nasogutta ephedrini (FoNo)
Identity tests: ephedrine
Assay: ephedrine

Chromatographic methods prescribed in the Pharmacopoeia VII.

Sparsorium sulfaboricum (FoNo)
Identity tests: sulphadimidine, boric acid.
Assay: sulphadimidine.

Measurement of physical data prescribed in pharmacopoeias (melting, boiling range, optical rotation, specific rotation, refraction, etc.)

Identification of 20 pharmaceutical substances on the basis of pharmacopoeial tests.
Methods of instrumental analysis.

SEMINARS

Acid- alkalimetry, direct titrations of strong acids and bases and weak acids and bases, back titrations, determination of organically combined nitrogen. Related with these all of the methods of pharmacopoeias and the prescriptions of the National Institute of Pharmacy (NIP) should be interpreted.


Oxidation reduction titrations with potassium permanganate, iodine, potassium iodadate, potassium bromate, cerium(IV) sulphate solutions. Karl-Fischer titrations (aquametry).

Argentometric titrations.

Complexometric methods: direct and back titrations. Gravimetric methods in Ph. Hg. VII.
Separation of complex mixtures of pharmaceuticals on the basis of chemical characters (weak acids, bases, amphoteric and neutral) of the components.
PHARMACEUTICAL TECHNOLOGY

7th semester

LECTURES

Pharmaceutical Technology III.

General instruction
Coating process of solid dosage forms
  - Requirements of coating process
  - Sugarcoating, filmcoating, melted coating
  - Instrumentation of coating process
Capsules
  - Categories of capsules
  - Soft and hard gelatin capsules
  - Capsule filling
  - Tests for capsules
Soaps, patches, preparations for veterinary use
  - Application of soaps
  - Process of preparation
  - Medicated plasters
  - FoNo VET and preparations

Homeopathy
  - Preparation of mather tincture
  - Preparation of potencies
  - Dosage forms

Drying
  - Classification of methods
  - Convective and radiation drying
  - Driers
  - Freeze drying

Crystallization processes
  - Operations and methods
  - Crystallization from melt
  - Spherical crystallization

Packaging, packaging materials
  - Requirements
  - Safety

Modification of biological activity
Interactions in pharmaceutical technology
  - Interaction and incompatibility
  - Causes and types
  - directions and guidelines

Stability of drugs and dosage forms
  - Stability
  - ICH and structure of ICH
  - Shelf life, reaction kinetics

Automatization, instrumentation and monitoring of technological processes
  - Product manufacturing process
  - On – line monitoring
  - Process development and optimization

PRACTICALS

Prescription pharmacy 2
General information
Fire safety
Solutions, repetition)
Ph.Hg.VIII, FoNo VII.)
Calculations
decoctum, infusum
_Colloidum cum acido salicylico FoNo VII. dos. I (10,0 g)_
_Gutta analeptica FoNo VI. dos. ½ (10,0 g). _
_Otogutta chloramphenicol FoNo Vet III. dos I (10,0 g)_
Suspensions
Emulsions
Units, Latin number
_Solution against perspiration (Husz-Regdon) (50,0 g)_
_Solutio gingivalis FoNo VII. dos. I (30,15 g)_
_Nasogutta containing protargol Manuale Pharmaceuticum dos. ½ (16,8 g)_
_Decoctum saponariae FoNo VII. dos. ½ (100,0 g)_
Self-made preparations
Checking the dose
_Infusum sennae cum magnesio sulfurico (100,0 g)_
_Suspendo bismuthi subsalicylici pro infante FoNo VI. dos. I (100,0 g)_
_Suspendo expectorans FoNo VII. dos ½ (100,0 g)_
_Emulsio olei jechoris FoNo VII. dos. ½ (100,0 g)_
_Linimentum scabicidum FoNo VII. dos. ½ (50,0 g)_
_Linimentum sulfadimidini FoNo Vet. II. dos. I, (50,0 g)_
_Suspendo anaesthetica FoNo VII. dos. I (100,0 g) ½ cs_ 
_Suspendo salicylamidi 2% cum sorbito FoNo VI. dos. I (100,0 g)_
_Suspendo zinci aquosa FoNo VII. dos. I (=100,0 g)_
_Zinkoxidshüttelmixtur NRF 2001 dos. I (100,0 g)_
_Zinkoxyd-Schüttelpinselung NFA dos. I (100,0 g)_
_Linimentum calcis FoNo VI. dos. ½ (50,0 g)_
_Linimentum ammoniatum FoNo VII. dos. ½ (50,0 g)_
_Incomp. III. (solution or suspension) (100,0 g)_
_Gargarisma antisepticum Fo No VII. dos. ½ (34,2 g)_
Powders
Divided and undivided powders
Dusting powders
_Capsula operculata_
Incompatibility
_Tea mixtures_
Emulsions, suspensions
Powder dividing by eyes, checking with measurement
Powder dividing by Hunfalvyl, checking with measurement
_Capsula operculata calibration_
Pills
_Calculation, writing of prescription_
_Infusum sennae cum magnesio sulfurico (100,0 g)_
_Pulvis coffeini 50 mg FoNo VII. dos. 1/3 (No. X)_
_Pilula coffeini 50 mg FoNo VII. dos. I (No. XXX)_
_Sparsorium antisudoricum FoNo VII. dos. ½ (34,2 g)_
_Pulvis calcii lactophosphorici FoNo VII. dos ½ (25,0 g)_
Suppository
_Preparing of suppository with moulding and hand-made method_
Calibration of moulding forms
_Suppository containing Bismuthum subgallicum (No. X)_
_Hard gelatine capsules containing Ascorbic acid (No. XX)_
_Pulvis bismuthi tannici FoNo VII. dos. ½ (No. X)_
_Suppositorium analgeticum forte FoNo VII. dos. ½ (No. III)_
_Suppositorium antipyrepticum pro infante FoNo. VII. dos. I (No. VI)_
_Suppositorium paracetamoli 60 mg FoNo VII. dos. I (No. X)_
_Vaginal dosage forms_
_Stifts_
_Powders_
_Calculation for moulding and hand-made method_
_Sal ad rehydrationem cum natrio hydrogencarbonico pro parvulo FoNo VII. dos. I. (30,8 g)_
Oralypulver 60 SR 2001 dos. I (28,0 g)
Oral Rehydration Salts BP 1998 dos. I (27,9 g)
Emulsio paraffini cum phenolphthaleino FoNo VII. dos. ½ (100,0 g)
Globulus containing Zincum sulfuricum (No. IV)
Suppositorium laxans FoNo. VII. dos. I (No. X)
Pilula tonisans FoNo VI. dos. ½ (No. XXV)
Ovulum metronidazoli FoNo VII. dos. I (No. X)
Suppositorium ad nodum FoNo. VII. dos. I (No. X)
Suppository containing Benzocainum Manuale Pharmaceuticum dos. 1/10 (No. X)
Inkomp. VI. dusting powder (50,0 g)
Eoszacharum containing barbitalum (No. X)
Suppository
Calculation of prescription components
Globulus metronidazoli compositus FoNo VII. dos. I. (No. X) ½ g.globulus
Suppositorium expectorans FoNo VI. dos. I. (No. VI)
Suppository for children Manuale Pharmaceuticum dos. I (No. X)
Effervescent powder for x-ray (Manuale Pharmaceuticum dos. I (16,6 g)
SELF-MADE PREPARATIONS

Preparation of sterile and aseptic dosage forms
Aseptic preparation
Eye-drops
Solutions for eye-drops
  Solutio ophthalmica
    cum benzalkonio
  Solvens pro oculoguttis
    cum benzalkonio
    cum thiomersalo
  Solvens viscosa pro oculoguttis
    cum thiomersalo
    cum cetrimido
  Hydrogelum carbomerae pro oculoguttis
FoNo preparations
  Oculogutta antidota
  Oculogutta atropini
  Oculogutta carbomerae
  Oculogutta chloramphenicol
  Oculogutta erythromycin
  Oculogutta gentamicini
  Oculogutta homatropini
  Oculogutta indosoli
  Oculogutta naphazolini
  Oculogutta neomycin
  Oculogutta neonatorum
  Oculogutta pilocarpini
  Oculogutta polymyxini
  Oculogutta rifampicini
  Oculogutta scopalamini
  Oculogutta tetracaini
  Oculogutta viscosa
  Oculogutta zinci

Eye ointments
Bases of eye ointments
  Oculentum simplex
  Oculentum hydrosum
  Oculentum basis
FoNo preparations
  Oculentum dionini
  Oculentum erythromycin
  Oculentum neomycin
  Oculentum neomycin cum prednisolono
Aerosols, inhalasols
Concentration of infusion solutions, isotonic calculations
Sterilization
Pyrogens, pyrogen removal methods
Filtration
Large volume parenteral preparations
Infusions with electrolyte
  *Infusio natrii chlorati*
  *Infusio salina*
Infusions with sugars
  *Infusio glucosi*
  *Infusio manniti*
  *Infusio sorbiti*
Infusions with electrolyte and sugars
  *Infusio glucosi cum kalio*
  *Infusio glucosi salina*
Investigation of large volume parenteral preparations
Supplementary infusions
Stock solution
  *Natrium lacticum solutum 20% pro infusione*
Infusions for correction of acidosis
  *Infusio natrii lactici*
  *Infusio natrii hydrogencarbonici*
Infusions for correction of alkalosis
  *Infusio gastrica*
Dialysis
Peritoneal dialysis solutions
  *Solutio pro dialysi peritoniale I.*
  *Solutio pro dialysi peritoniale II.*
Perfusion solutions
Plasma substitute infusions
  *Infusio dextrani*
Parenteral nutrition
Preparation of parenteral nutrition infusion
  *Magistral parenteral nutrition infusion*
Injections
  *Injectio natrii chlorati*
  *Injectio glucosi*
  *Injectio papaverinii chlorati*
  *Injectio coffeini natrii benzoici*
Investigation of injections
Non-heat sterilizable injections
  *Injectio urea*
  *Injectio aethylmorphinii chlorati*
Multidosage injections
  *Injectio procainii chlorati*
  *Injectio atropinii sulfurici*
Powder ampoules
  *Kalium chloratum sterilizatum*
  *Injectio trometamoli cryosiccata*
Liofilization
Emulsion and suspension type injections
Visit in the Central Pharmacy
8th semester

LECTURES

Pharmaceutical Technology IV.

Pharmaceutical technology and biopharmaceutics
LADMER
  Biopharmaceutical considerations in drug product design
  Bioavailability
  Biopharmaceutical Classification System

Effect of the physico-chemical properties of the drugs and the type of dosage forms on the biological response
Physico-chemical profiling of the drug
  Solubility, lipophylicity, ionization (pKa), log P
  Permeability

Absorption in the GI tract
  Absorption in the mouth
  Absorption in the gastric tract
  Absorption in the intestinal tract
  Colon therapy
  Rectal therapy
  Traditional and modified drug release preparations

Parenteral application and pharmaceutical parameters
Pharmacokinetics models
  Clearance
  Factors effecting drug absorption by injection

Inhalasols
  Lung and its biopharmaceutical aspects
  Dosage forms and their special requirements
  Lung delivery systems

Dermal and transdermal drug delivery systems
  Skin parameters
  Permeation enhancers
  Ointment bases and application
  Patches and their mechanism

Biopharmaceutical aspects of
  dental,
  vaginal
  ophthalmic
  otic and
  nasal preparations

Rectal drug delivery systems
  Rectal dosage forms
  Formulation factors
  Drug absorption modifiers

Pediatric dosing and dosage forms
  Pediatric pharmacokinetics and pharmacodynamics
  Excipients
  Administration routes

Therapeutic systems I
  Solid systems
  Biodegradable polymers

Therapeutic systems II
  Semisolid systems
  TTS
  Lyotropic liquid crystals
  Micro- and multiple emulsions
  Microspheres, liposomes

In vitro dissolution test methods
Ex vivo and in vivo methods
Characterisation of dissolution profiles
Comparision of dissolution profiles IVIVC
Biopharmaceutical aspects of original and generic preparations

PRACTICALS

Prescription pharmacy 3
General rules
Repetition of liquid dosage forms
  Suspensio bismogeli (FoNo VII., 100 g)
  Sirupus kali chlorati (FoNo VII., 100 g)
Repetition of solid dosage forms
  Sparsorium antymycoticum (FoNo VII., 50 g)
  Suppositorium noraminophenazoni 500 mg (FoNo VII., N° VI.)
Ointments, Creams, Pastes, Hydrogels
  Globulus glycerini boraxati (FoNo VII., N° X.)
  Ung. salicylatum 1% (FoNo VII., 30,0 g)
  Ung. boraxatum (FoNo VII., 50,0 g)
  Hydrogelum antisudoricum (FoNo VII., 25,0 g)
  Ung. nystatini (FoNo VII., 50,0 g)
  Ung. carbamidi (FoNo VII., 25,0 g)
  Ung. dithranoli 0,1%
Incompatibilities
  Inkomp. IV. – ointment 30,0 g)
  Ung. camphoratum ad perrionem (FoNo VII., 30,0 g)
  Ung. lidocaini ad rhagades (FoNo VII., 20,0 g)
  Pasta antirheumatica (FoNo VII., 175,0 g [1/2 dózis])
  Ung. antisepticum (FoNo VII., 30,0 g)
  Ung. contra panaritium (FoNo Vét. III., 50,0 g)
  Ung. nasale (FoNo VII., 10,0 g)
  Detergens sulfuratum (FoNo VII., 100,0 g)
  Zincum gelatinosum 50,0 g (FoNo VI. előirata)
  Lanstein paszta Manuale Pharmacueticum 100,0 g
  Hydrophile Metronidazol-Creme 2% Standardisierte Rezepturen 2001 (NRF/SR) 100,0 g
  Anionische Nystatin-Creme 100,0 g
Homeopathy
Aromatherapy
SELF-MADE PREPARATIONS

Formulation and preparation of solid dosage forms
Cycle 1

Powder rheological investigation and qualification of raw materials with ASTM apparatus (effective and auxiliary materials).
Powder rheological investigation and qualification of raw materials with PTG-1 equipment (effective and auxiliary materials).
Particle size investigation of raw materials with a vibration sieve analysis method.
Moisture content investigation of raw materials.
Compactibility investigation of materials.
Investigation of water absorbing capacity of raw materials and powder mixtures.
Preparing granules with high shear mixer (solvent granulation with Pro-c-epT equipment).
Preparing granules (binder granulation with LuxRoyal equipment).
Preparing granules with centrifugal granulator (binder granulation with Freund CF-360 equipment).
Preparing granules with fluid granulator (binder granulation with Strea-1 equipment).
Capsule filling and blistering. Mass control of filled capsules.
Cycle 2

Compressibility investigation of different materials with the use of different compression forces. Recording and analysing different pressure curves. Geometrical investigation of tablets prepared by different compression forces. Physical investigation of different tablets (breaking hardness, friability, etc.). Tablet preparation by direct compressing without auxiliary materials with the use of eccentric tablet machine. Tablet preparation by direct compression with auxiliary materials with the use of eccentric tablet machine. Tablet preparation with rotary tablet machine. Preparing and mechanical investigation of tablets with effective materials compressed with different compression forces. Water absorbing capacity of different tablets. Dissolution and solution test of different tablets. Sartorius resorption test.

Cycle 3


Investigation of dosage forms

Investigation of suspensions:
- distributional stability investigations of flocculated and non-flocculated suspensions
- determination of the type of sedimentation and the half life time
- investigation of the effect of different additives on the sedimentation process.

Investigation of air humidity on the geometrical parameters of tablets:
- determination the influence of 100% relative air humidity on the weight and geometrical parameters of phenylbutazone tablets.

Investigation of polymer films:
- determination of solving time of gelatin films with different thickness in artificial gastric and intestinal juice.

Investigation of hydrophyl sol's viscosity changing:
- study the viscosity changing by electrolites of the Muclago methylcellulosi and Muclago hydroxyethylcellulosi.

Investigation of ointments I:
- Characterization of water-free ointment bases with the help of physical investigations.

Investigation of ointments II:
- Determination of washability and rheological features of ointments.

Investigation of ointments III:
- Consistency characterisation of the ointments by determining viscosity, spreadability and adhesion.

Determination of average molecular weight of dextrane:
- Determination of average molecular weight of dextrane with measuring density and viscosity.

Water-absorption of polymers:

Light permeability determination of glass containers:
- Investigation of transmittancy of glass containers with different colours in a given wave length range.

Investigation of drug release by means of the agar diffusion plate method:
- Investigation of drug release from different ointments.

Determination of drop weight:
- Investigation of the effect of different additives on the drop-weight and surface tension.
PHARMACODYNAMICS-TOXICOLOGY

LECTURES

**Basic pharmacology**
- Basic principles
- Drug tolerance and dependence
- Routes of drug administration and absorption
- Distribution of drugs in the body
- Elimination of drugs
- Drug interactions
- Clinical pharmacology

**Special pharmacology**
- Drugs acting on the CNS
- Drugs acting on the peripheral nervous system
- Drugs influencing the striated muscle and the smooth muscle function
- Pharmacology of cardiovascular drugs
- Drugs acting on the blood function
- Drugs influencing the respiratory and airways function
- Drugs affecting renal function and electrolyte metabolism
- Drugs influencing the gastrointestinal function
- Vitamins and hormones
- Pharmacology of the reproductive system
- Pharmacology of inflammation
- Drugs affecting microbial and neoplastic diseases
- Dermatologic pharmacology

**Toxicology**
- Acute and chronic poisoning
- Symptoms of intoxication
- Prevention and treatment of poisoning
- Heavy metal and non-metallic intoxications, pesticides, solvents, vapors and air pollutants

PRACTICALS

Administration of drugs to experimental animals. Demonstration of the local and systemic effect. Enteral and parenteral route of administration.


Neuroleptics and tranquillizing drugs. Evaluation of behavioral effects of drugs in mice and rats (locomotor activity, jumping test, motor coordination).

Convulsants and analeptic drugs. Effects of strychnine and pentylenetetrazol. Anticonvulsant drugs. Reversal of respiratory depression.

Investigation of local anaesthetics on frog skin and rabbit cornea. In vitro demonstration of nerve block anaesthesia.

Agents acting on the autonomic nervous system. Effects on isolated frog heart, the pupil of rabbit and the salivary secretion of rat.

Agents acting on the autonomic nervous system. Demonstration of drug effects on isolated ganglia and nictitating membrane of cat.

Agents acting on the autonomic nervous system. Effects on cholinergic and adrenergic drugs on the blood pressure of anaesthetized animals.

Agents affecting the smooth muscle function. Demonstration of the action of drugs on isolated ileum.

Drugs affecting the striated muscles. Muscle relaxant effect of tubocurarine and succinylcholine.

Effect of cardiotonics on isolated frog heart. Demonstration of cardiac action with the help of ECG.

Vasoconstrictor and vasodilator effect of drugs. Laewen-Trendelenburg experiments.

Diuretic effect of drugs in rats and in anaesthetized rabbit.


Choleretic and laxative drugs. Biliary excretion of BSP. Investigation of laxative effect.

Pharmacological effects of histamine and antihistamines. Effect of drugs on permeability of capillaries in rat.

Investigation of antiphlogistics. Demonstration of drug effect in rat-paw edema, exudative pleuritis and cotton-granuloma tests.

## Public Health

### 7th semester (15 weeks)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE</th>
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</table>
| 1.   | (2 hrs/week)  
The scope and goals of Public Health. The concept of health and diseases. Effects of natural and social environments on human health |
| 2.   | Epidemiology of communicable diseases. General aspects. Vaccination, sterilization and DDD |
| 3.   | Epidemiology of aerogenic diseases  
Epidemiology of enteric diseases, toxicoinfections |
| 4.   | Epidemiology of cutaneous and sexually transmitted diseases |
| 5.   | Epidemiology of haematogenic diseases and zoonoses |
| 6.   | Prion diseases. Prevention of nosocomial diseases |
| 7.   | HOLIDAY |
| 8.   | AUTUMN BREAK |
| 9.   | 10. Basic knowledge of demography |
| 11.  | Basic knowledge of epidemiology. The uses of most important epidemiologic methods |
| 12.  | Epidemiology of cardiovascular and cerebrovascular diseases. Epidemiology of tumours |
| 13.  | Epidemiology of other chronic diseases (pulmonary, gastrointestinal diseases, osteoporosis). |
| 14.  | Epidemiology of accidents and suicides |
| 15.  | Structure and operation of the health care systems; the health services in different countries |
### Public Health

#### 8th semester (15 weeks)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE</th>
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<tbody>
<tr>
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<td>(2 hrs/week)</td>
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<tr>
<td>1.</td>
<td>Epidemiology of smoking, alcohol and drug consumption</td>
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<tr>
<td>2.</td>
<td>Influencing the health status of high risk populations (mother, infant, youth, elderly)</td>
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<tr>
<td>3.</td>
<td>Environmental hygiene: the ecological and health effects of air pollution</td>
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<tr>
<td>4.</td>
<td>Environmental hygiene: the ecological and health effects of water pollution, sewage disposal</td>
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<tr>
<td>5.</td>
<td>Environmental hygiene: the ecological and health effects of soil pollution and waste incl. hazardous waste disposal.</td>
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<td>6.</td>
<td>Hygiene of settlements and dwellings.</td>
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<td>7.</td>
<td>Urbanization</td>
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<tr>
<td>8.</td>
<td><strong>SPRING BREAK</strong></td>
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<tr>
<td>9.</td>
<td>Environmental and occupational hygienic requirements in establishing and operating public and hospital pharmacies</td>
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<tr>
<td>10.</td>
<td>General occupational health and ergonomy.</td>
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<tr>
<td>11.</td>
<td>Health effects of excesses of temperature, noise and vibration.</td>
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<tr>
<td>12.</td>
<td>Health effects of ionizing and non-ionizing radiation. Pneumoconiosis</td>
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<tr>
<td>13.</td>
<td>Basic toxicology. Toxicology of heavy metals and solvents</td>
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<tr>
<td>14.</td>
<td>Toxicology of gases, plastics, PAH, dioxins, etc.</td>
</tr>
<tr>
<td>15.</td>
<td>Toxicology of agrochemicals. Risk assessment, management and communication</td>
</tr>
</tbody>
</table>
ETHICS IN PHARMACY

Basic definition
Human rights in pharmaceutical practice
The calling of pharmacists
Development of medical and pharmaceutical ethics
Hungarian universities and academies
Chinese medicine.
Islamic medical ethics
Roman Catholicism (the Greek /Orthodox/ Church)
Protestantism
Seventy-day Adventists. The Mormons.
Jehovah’s Witnesses
Jewish medical ethics
Ethics of feudal and bourgeois society
European and Hungarian pharmacy between 1940-1950
Socialist system of medicine supply (1950-1990)
The most important requirements of the pharmaceutical profession
Fundamental principles of pharmaceutical ethics
Pharmaceutical oath. Hippocratic oath.
Attitudes and ethics. Ethical code of pharmacists.
Connections between pharmacist and patient
Responsibilities of pharmacists
Abuses with medicines
Connections between pharmacist and pharmacy workers
Connections between pharmacist and physician
Connections between pharmacist and power
The importance of self-control
Official secrecy
Secrecy and computer techniques
Personal incompatibility
Pharmacists in public life. Ethical aspects of private life.
Activity of pharmacists in health education
Gratitude of the patient
Ethical aspects of drug research
Classification of drug studies by the FDA
Competency of pharmacists. Ethical aspects of education.
Ethical aspects of trade of medicines
Transplantation of organs
The service of the dead on behalf of the living
The limited protection of cadaver
To die with dignity
Veterinary deontology

DRUG REGULATORY AFFAIRS

1. Content of Pharmaceutical legislation
2. „Regulated” „standardised” fields
3. Order of levels of proof for the efficacy of medicines
4. Drug manufacture, procurement and wholesale distribution
5. Retail drug supply
6. Selection of drugs
7. Regulation of narcotic issues
8. Regulation of psychotropic issues
9. Herbal medicines
10. The WHO Model list of Essential Drugs
11. Regulation of precursor substances
12. The registration of generics and the European Union marketing authorisation rules
13. Content of a law and Public Authority decisions
14. Registration of drugs
15. Clinical trials regulation
16. Basic pharmaco-economy
FUNDAMENTALS OF CLINICAL THERAPY

Internal medicine
- The patient's examination
- The more important diseases of the circulatory system and their therapy
- Diseases of the respiratory system: therapy
- Diseases of the kidneys: therapy
- Diseases of the digestive system: therapy
- The most important diseases of the ductless glands and their therapy
- Diseases of the blood: therapeutic possibilities

Surgery
- Resuscitation; restitution of the circulation and of the breathing
- Mass accidents; emergency service
- Skull-injuries; commotio, contusio, compressio: fracture of bones; sprain
- Dull-damages of the chest
- The types of bleeding and their therapy
- Burning damages
- Appendicitis, ileus, acute abdomen

Pediatrics
- The periods of childhood
- The main stations of the baby's and child's normal development
- The conditions of the reasonable treatment
- The various types of treatment, the sorts of taking in the drugs; which are the rules in childhood?
- Special standpoints of drug use in Pediatrics
- Methods of antifebrile therapy in Pediatrics
- Antispasmodic drugs in Pediatrics
- The treatment of circulatory insufficiency and shock
- What to do in case of status asthmaticus?
- The most common complaints of the respiratory system in childhood; treatment.

Obstetrics and Gynaecology
- Pharmacological influence of the uterus' activity
  /oxytocin, prostaglandins, beta-mimetics etc./
- The starting of a delivery
- Disseminated intravascular coagulation /DIC/: placenta praevia, missed abortion, rupture of the uterus
- "Extrauterin" pregnancy
- Acute inflammatory diseases in obstetrics="/post partum" endometritis, septic abortion etc./
- Torsion of ovarian cyst's peduncle

Neurology, psychiatry
- The role of psychiatry in the education of medical and pharmacy students.
- The symptoms of increased intracranial pressure and its treatment
- The course of parkinsonism and its treatment
- Schizophrenia
- Psychosis maniaco-depressiva
- Neurological, psychiatric and social consequences of alcoholism
- Polytoxicomania
- Suicide
- Enumeration of psychic abnormalities and the principles of the treatment
CLINICAL PHARMACY I.

Introduction to Clinical Pharmacy
Activity round and function areas of clinical pharmacy. General and special works of clinical pharmacy. Connection of clinical pharmacist with pharmacotherapy and drug order. Drug safety.
The role and works of pharmacist in the in-patient provision
Place of pharmacist in medical attendance. The role of pharmacist in drug provision. Connection with patients, physicians, nurses, members of other disciplines.
Clinical importance of drug formulation
Non-compliance
Therapeutic drug monitoring
Drug side-effects
Drug side-effects. Classification, reasons of drug side-effects. Drug side-effect monitoring systems.
Drug interactions
Influential factors of development of drug interactions. Mechanism of drug interactions, its evaluating methods. Clinical important interactions.
Drug information
Topics connected with drug information. The role of pharmacist. The sources of information, its storage and retrieval.

VETERINARY PHARMACY PRACTICE

Introduction to veterinary pharmacy
Certain animal diseases
Basic course of veterinary pharmacology
Basic pharmacology
Drugs acting on the CNS
Pharmacology of the autonomic nervous system. Ganglion exciting agents. Stimulants of parasympathetic end-organs, or parasympathomimetics. Inhibitors of parasympathetic end-organs, or parasympatholytics. Stimulants of sympathetic end-organs, or sympathomimetics. Inhibitors of sympathetic end-organs, or sympatholytics. Stimulants of sympathetic and parasympathetic centers.
Spasmolytics or drugs influencing the smooth muscle function
Muscle relaxants or drugs inhibiting the skeletal muscle function
Cardiovascular drugs
Drugs acting on the body water, salt and ion turnover
Drugs influencing the respiratory and airway function
The pharmacology of blood
Drugs influencing the function of the GI tract
Drugs influencing the hepatic function
Mineral substances influencing the metabolism
Vitamins and hypovitaminoses
Medicines of vaginal and uterine diseases
Introduction. Medicines.
Pharmacology of inflammation
Pharmacons acting on the immune system
Medicines in dermatology and for treatment of the external auditory canal
Disinfectants
Chemotherapeutics
Antibactericidal pharmacons
1st group: Sulfonamides
Sulfonamides with a short or moderate effect. Long acting sulfonamides. Combination of sulfonamides and trimethoprim.
2nd group: Antibiotics
Chloramphenicol
Beta-lactam antibiotics /Penicillin, Cephalosporins, other beta-lactam antibiotics./
Polypeptide antibiotics /Polymyxins, Bacitracin./
Aminoglycosides /Streptomycin, Neomycin, Kanamycin, Amikacin, Tobramycin, Apramycin, Gentamycin, Spectinomycin./
Tetracyclines
Macrolides /Erythromycin, Tylosin, Oleandomycin, Spiramycin, Kitasamycin/
Other antibiotics /Lincomycin, Tiamulin, Virginiamycin, Novobiocin, Rifamycins, Fumagillin, Vancomycin, Fusidic acid./
3rd group: Other antibacterial pharmacons
Nitrofuran derivatives /Furazolidone, Nitrofurantoin./
quinoline derivatives /Halogenated quinolines, Quinolonic acid derivatives, Nalidixic acid, Oxolinic acid, Flumequine, Enrofloxacin./
4th group: Combinations of antibiotics and chemotherapeutics
Antiviral agents
Antitumorous pharmacons
Insecticides.
Growth promotants
Mastitis and its medicines
Ophthalmologic preparations
Nutritive and medicated premixes
Rodenticides
Preparations used in bee-keeping
Certain diseases of fish and their medication
Animals and medicines in zoos
Immune biological preparations and diagnostics
Miscellaneous
Treatment of poisoned animals
Medicines for euthanasia in veterinary practice
Vow to be made by 1st year medical and dental students

I ........................................../ as the student of University of Szeged / will observe and adhere / to the rules and regulations / of the Hungarian Republic. / Also I will observe and adhere / to the rules and regulations / of University of Szeged / and I am aware of these. / I devote all my best efforts / to go through with my studies here / as efficiently as possible. / I will give to my teachers / the respect and gratitude / which is their due. / I will respect the secrets / which are confided in me / even after the patient has died. / I will maintain by all means in my power / the honor and the noble traditions / of the medical and dental profession. / I will devote my time and efforts / to learn the progressive achievements / of the basic and clinical sciences / in order to use this knowledge / for advancing medicine and dentistry, / for the care of my patients / and to promote man's progress on Earth. / I make these promises solemnly, / freely, / and upon my honor.

Oath to be taken by medical and dental graduates

I, ........ name ........, / on this occasion / of my admission / to the ranks of the medical profession / swear on my honor / to devote my talents and knowledge / to the benefit of mankind. / I shall hold / University of Szeged in esteem. / I shall count those / who have instructed me / in the science of medicine / as my masters, / and shall show them / gratitude and respect at all times. / I shall impart my medical knowledge / and experience / to the generations of physicians to come. / I shall constantly labour / to increase my erudition / with a view to developing / and advancing medical science. / I shall practice my profession / conscientiously. / I vow to devote / my medical knowledge / to the protection of health / and to the benefit of the sick. / I shall treat / and advise patients / in the best of their interest / and to the best of my knowledge / and convictions / and I shall strive / to safeguard their health / against hazardous / and injurious effects. / I shall reveal no secret / concerning my fellow men / whether learned within my practice of medicine / or outside it / unless the law demands this. / I shall inform the patients / and also their relatives / if the patients’ interest so requires / as to the patients’ condition / and the method of treatment / in a timely and considerate manner. / I shall issue a medical certificate / only in accordance with my true convictions. / I shall conduct myself / towards the patients / my fellow physicians and the society as a whole, / in a matter befitting my calling as a physician. / I shall preserve the honor / of the medical profession / and its noble traditions. / I shall not be hampered / from fulfilling the duties of my profession / on the grounds of social, / political, / national, / racial / or religious distinction. / I take this oath solemnly / and of my own free will.

Vow to be made by 1st year pharmacy students

I ................. name ................./ as the student of the University of Szeged / promise solemnly/ that I will will respect the Constitution and laws/ of the Hungarian Republic. I will also observe and adhere / to the rules and regulations / of the University of Szeged. / I promise to devote all my best efforts / to go through with my studies here / as efficiently as possible. / I will give to my teachers / the respect and gratitude / which is their due. / I will respect the secrets of the patients / which are confided in me / during my course of studies. / I will maintain by all means in my power / the honor and the noble traditions / of my profession. / I will devote my time and efforts / to learn the progressive achievements / of the basic and clinical sciences / in order to use this knowledge / for advancing medicine, / for the care of my patients / and to promote man's progress on Earth. / I make these promises solemnly, / freely, / and upon my honor.

Oath to be taken by pharmacy graduates

I.......  name ....., / hereby swear / that I shall always maintain / an attitude in accordance / with my vocation as a pharmacist. / In my professional practice, / I shall proceed with the greatest degree / of conscientiousness / and with the utmost diligence. / I shall always behave / worthy of my profession. / As part of the healing work, / I shall devote all my energies / to the protection and recovery / of the health of the individual and society. / I shall not reveal any data / concerning the health status / or the medication of my patients / unless the law obliges me to. / I shall maintain / my theoretical and practical knowledge /at a high level. / I shall never use my knowledge / for activities that are contrary / to the ethical code of pharmacists. / I shall use my knowledge / only for the defence / and restoration of health / of my fellow humans. / I shall do my best / to promote the science of pharmacy/ and keep the good name / of the University of Szeged. / I take this oath solemnly / and of my own free will.