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

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

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 1st year fall, 1st semester								
	Compulsory Subjects							
GYTKKA041	Physics-Biophysics I.	Experimental Physics Department	Dr. PÉTER MAKRA associate professor	2	-	Exam	2	-
GYTKKA011	History of Pharmacy	Phramaceutical Chemistry Department	Dr. LAJOS SIMON associate professor	2	-	Exam	2	-
GYTKKA021	Mathematics	Department of Medical Informatics	Dr. JÁNOS KARSAI senior research associate	2	-	Exam	3	-
GYTKKA022	Mathematics	Department of Medical Informatics	Dr. JÓZSEF ELLER senior research associate	-	2	Term Mark	2	-
GYTKKA031	Informatics	Department of Medical Informatics	Dr. FERENC PETÁK associate professor	-	2	Term Mark	2	-
GYTKKA051	General Chemistry	Physical Chemistry Department	Dr. ÁRPÁD SZŰCS associate professor	2	-	Exam	3	-
GYTKKA052	General Chemistry	Physical Chemistry Department	Dr. ATTILA HORVÁTH assistant professor	-	4	Term Mark	3	-
GYTKKA0□1	Pharmaceutical Biology	Medical Genetics Department	Prof. habil. JÁNOS SZABÓ professor, Head of Department	2	-	Exam	3	-
GYTKKA0□2	Pharmaceutical Biology	Medical Genetics Department	Prof. habil. JÁNOS SZABÓ professor, Head of Department	-	2	S	0	-
GYTKKA111	Anatomy I.	Anatomy Department	Prof. habil. ANDRÁS MIHÁLY professor, Head of Department	2	-	Exam	2	-
GYTKKA491	English Language I.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	2	Term Mark	0	-
GYTKKA981	Latin Language	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	2	Term Mark	2	-
GYTKKA4□1	Hungarian Language I.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	4	Term Mark	2	-
	Elective Subjects							
GYTKKA901	General Laws in Sciences	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	2	-	Evaluation	2	-
GYTKKA1041	Short History of Hungary I.	Behavioural Sciences Department	SERFŐZŐNÉ Dr. ADÉL TÓTH assistant professor	1	-	Evaluation	2	-
	Criteria Subjects							
XT	Physical Training			1	-	S	0	-
Total:				**16**	**18**		**30**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 1st year spring, 2nd semester								
	Compulsory Subjects							
GYTKKA042	Physics-Biophysics II.	Experimental Physics Department	Dr. PÉTER MAKRA associate professor	2	-	Exam	3	Physics-Biophysics I.
GYTKKA043	Physics-Biophysics II.	Experimental Physics Department	PÉTER MAKRA department associate	-	3	Term Mark	2	Physics-Biophysics I.
GYTKKA061	Inorganic Chemistry	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	3	-	Exam	4	General Chemistry exam
GYTKKA091	Qualitative Chemical Analysis	Pharmaceutical Chemistry Department	Dr. Tamás Martinek associate professor	2	-	Exam	3	General Chemistry exam, practice
GYTKKA092	Qualitative Chemical Analysis	Pharmaceutical Chemistry Department	Dr. Tamás Martinek associate professor	-	5	Term Mark	4	General Chemistry exam, practice
GYTKKA101	Quantitative Chemical Analysis I.	Inorganic and Analitical Chemistry Dept.	Dr. Galbács Gábor associate professor	2	-	S	0	General Chemistry exam, practice
GYTKKA102	Quantitative Chemical Analysis I.	Inorganic and Analitical Chemistry Dept.	Dr. Gajdáné Dr. Schrantz Krisztina assistant professor	-	4	Term Mark	4	General Chemistry exam, practice
GYTKKA113	Anatomy II.	Anatomy Department	Prof. habil. ANDRÁS MIHÁLY professor, Head of Department	2	-	Exam	2	Anatomy I. exam
GYTKKA541	Biostatistics	Department of Medical Informatics	Dr. Krisztina Boda associate professor	1	-	Exam	2	Mathematics
GYTKKA542	Biostatistics	Department of Medical Informatics	Dr. Krisztina Boda associate professor	-	1	S	0	Mathematics
GYTKKA531	First Aid and Resuscitation	National Ambulance Service	Dr. Andrea Cserjés head physician	1	-	S	0	-
GYTKKA532	First Aid and Resuscitation	National Ambulance Service	Dr. Andrea Cserjés head physician	-	1	Term Mark	2	-
GYTKKA492	English Language	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	2	Term Mark	0	English Language I.
GYTKKA4□2	Hungarian Language II.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	4	Term Mark	2	Hungarian Lang. I.
	Elective Subjects (2 subjects)							
GYTKKA891	Radiochemistry	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	2	-	Evaluation	2	-
GYTKKA1042	Short History of Hungary II.	Behavioural Sciences Department	SERFŐZŐNÉ Dr. ADÉL TÓTH assistant professor	1	-	Evaluation	2	Short History of Hungary I.
Total:				**16**	**20**		**32**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 2nd year fall, 3rd semester								
	Compulsory Subjects							
GYTKKA103	Quantitative Chemical Analysis II.	Inorganic and Analitical Chemistry Dept.	Dr. ANTAL PÉTER professor	3	-	CE	4	Quant. Chem. Anal. I. exam
GYTKKA104	Quantitative Chemical Analysis II.	Inorganic and Analitical Chemistry Dept.	Dr. GAJDÁNÉ DR. SCHRANTZ KRISZTINA assistant professor	-	4	Term Mark	3	Quant. Chem. Anal. I. practice
GYTKKA121	Organic Chemistry I.	Institute of Pharmaceutical Chemistry	Prof. habil. FERENC FÜLÖP professor, Head of Department	4	-	Exam	4	General Chem., Quant. Chem. Analysis
GYTKKA122	Organic Chemistry I.	Institute of Pharmaceutical Chemistry	Dr. LORAND KISS assistant professor	-	6	Term Mark	5	General Chem., Quant. Chem. Analysis
GYTKKA141	Pharmaceutical Botany I.	Pharmacognosy Department	Dr. ZSUZSANNA HAJDÚ associate professor	1	-	Exam	2	-
GYTKKA151	Physiology I.	Physiology Department	Dr. habil. GYÖNGYI HORVÁTH professor	4	-	Exam	4	Anatomy II. exam
GYTKKA152	Physiology I.	Physiology Department	Dr. BALÁZS BODOSI assistant professor	-	2	Term Mark	2	Anatomy II. exam
GYTKKA131	Physical Chemistry I.	Physical Chemistry Department	Dr. GÁBOR PEINTLER associate professor	2	-	Exam	2	Math. (exam, pract.), General Chem. (exam, pract.)
GYTKKA161	Colloid Chemistry	Colloid Chemistry Department	Dr. ETELKA TOMBÁCZ professor	2	-	Exam	3	Math. (exam), Gen. Chem. (exam, pr.), Quant. Chem.(pr.), Phys.-Biophys.
GYTKKA162	Colloid Chemistry	Colloid Chemistry Department	Dr. MÁRTA SZEKERES assistant professor	-	2	S	0	Math. (exam), Gen. Chem. (exam, pr.), Quant. Chem.(pr.), Phys.-Biophys.
GYTKKA4□3	Hungarian Language III.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	4	Term Mark	0	Hung. Lang. II.
	Elective Subjects							
GYTKKA 6□1	Practical Optical Spectroscopy	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	2	-	Evaluation	2	-
	Criteria Subjects							
XT	Physical Training				1	S	0	-
Total:				**18**	**19**		**32**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 2nd year spring, 4th semester								
	Compulsory Subjects							
GYTKKA132	Physical Chemistry II.	Physical Chemistry Department	Dr. GÁBOR PEINTLER associate professor	-	5	Term Mark	4	Phys. Chem. I. exam
GYTKKA123	Organic Chemistry II.	Institute of Pharmaceutical Chemistry	Prof. FERENC FÜLÖP professor, Head of Department	3	-	CE	5	Organic Chem. I. exam
GYTKKA142	Pharmaceutical Botany II.	Pharmacognosy Department	Dr. ZSUZSANNA HAJDÚ associate professor	2	-	Exam	3	Pharm. Botany I. exam
GYTKKA143	Pharmaceutical Botany	Pharmacognosy Department	Dr. ZSUZSANNA HAJDÚ associate professor	-	2	Term Mark	2	Pharm. Botany I. exam, paralel: Pharm. Botany II.
GYTKKA153	Physiology II.	Physiology Department	Dr. habil. GYÖNGYI HORVÁTH professor	4	-	CE	6	Physiology I. (exam, practice)
GYTKKA154	Physiology II.	Physiology Department	Dr. BALÁZS BODOSI assistant professor	-	2	S	0	Physiology I. (exam, practice)
GYTKKA1□1	Biochemistry	Biochemistry Department	Prof. habil.LÁSZLÓ DUX professor, Head of Department	4	-	Exam	4	Anatomy II. (exam), Physiology I. (exam, pract.)
GYTKKA591	Pharmaceutical Propedeutics	Pharmaceutical Technology Department	Prof. habil. ISTVÁN ERŐS professor	2	-	Exam	3	-
GYTKKA4□4	Hungarian Language IV.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	4	Term Mark	0	Hung. Lang. III.
	Elective Subjects							
GYTKKA891	Radiochemistry	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	2	-	Evaluation	2	-
GYTKKA1051	Basic Communication	Department of Drug Regulatory Affairs	Dr. ILDIKÓ CSÓKA associate professor	2	-	Evaluation	2	
	Criteria Subjects							
XT	Physical Training			-	1	S	0	-
Total:				**19**	**14**		**31**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 3rd year fall, 5th semester								
	Compulsory Subjects							
GYTKKA181	Pharmacognosy I.	Pharmacognosy Department	Prof. habil. JUDIT HOHMANN professor, Head of Department	3	-	Exam	3	Organic Chem. II. exam, Botany II. (exam, pract.)
GYTKKA182	Pharmacognosy I.	Pharmacognosy Department	Dr. MÁRIA BÁTHORI professor	-	4	Term Mark	3	Organic Chem. II. exam, Botany II. (exam, pract.)
GYTKKA231	Pharmaceutical Chemistry I.	Institute of Pharmaceutical Chemistry	Prof. habil. FERENC FÜLÖP professor, Head of Department	4	-	Exam	5	Qual.Chem., Quant.Chem.II., Organic Chem. II.
GYTKKA232	Pharmaceutical Chemistry I.	Institute of Pharmaceutical Chemistry	Dr. ZSOLT SZAKONYI associate professor	-	6	Term Mark	5	Qual.Chem., Quant.Chem.II., Organic Chem. II.
GYTKKA221	Pharmaceutical Technology I.	Pharmaceutical Technology Department	Prof. habil. PIROSKA RÉVÉSZ professor, Head of Department	2	-	S	0	Phys. Chem. I., II., Colloid Chem.
GYTKKA201	Microbiology	Microbiology Department	Prof. habil. YVETTE MÁNDI professor, Head of Department	3	-	Exam	4	Biol.exam, Anat.II., Phys. II. exam, pr.
GYTKKA202	Microbiology	Microbiology Department	Prof. habil. YVETTE MÁNDI professor, Head of Department	-	2	S	0	Biology exam, Anatomy II., Physiology II. exam
GYTKKA211	Immunology	Microbiology Department	Prof. habil. YVETTE MÁNDI professor, Head of Department	2	-	Exam	2	Biology exam, Physiology II. exam, Biochem. exam
GYTKKA191	Pathophysiology I.	Pathophysiology Department	Prof. habil. GYULA SZABÓ professor, Head of Department	2	-	Exam	3	Anatomy II. exam, Physiology II. exam, pr., Biochem. exam
GYTKKA192	Pathophysiology I.	Pathophysiology Department	Prof. habil. GYULA SZABÓ professor, Head of Department	-	2	S	0	Anatomy II. exam, Physiology II. exam, pr., Biochem. exam
GYTKKA4□5	Hungarian Language V.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	3	Term Mark	0	Hung. Lang. IV.
	Elective Subjects							
GYTKKA840	Communication in Pharm. Practice	Department of Drug Regulatory Affairs	Dr. ILDIKÓ CSÓKA associate professor	2	-	Evaluation	2	-
	Criteria Subjects							
XT	Physical Training			-	1	S	0	
Total:				**18**	**18**		**27**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 3rd year spring, 6th semester								
	Compulsory Subjects							
GYTKKA183	Pharmacognosy II.	Pharmacognosy Department	Prof. habil. JUDIT HOHMANN professor, Head of Department	2	-	CE	3	Pharmacognosy I. exam
GYTKKA184	Pharmacognosy II.	Pharmacognosy Department	Dr. MÁRIA BÁTHORI professor	-	4	Term Mark	3	Pharmacognosy I. exam
GYTKKA233	Pharmaceutical Chemistry II.	Institute of Pharmaceutical Chemistry	Prof. habil. FERENC FÜLÖP professor, Head of Department	4	-	CE	5	Qual.Chem., Quant.Chem.II., Organic Chem. II.
GYTKKA234	Pharmaceutical Chemistry II.	Institute of Pharmaceutical Chemistry	Dr. ZSOLT SZAKONYI associate professor	-	6	Term Mark	5	Qual.Chem., Quant.Chem.II., Organic Chem. II.
GYTKKA222	Pharmaceutical Technology II.	Pharmaceutical Technology Department	Prof. habil. PIROSKA RÉVÉSZ professor, Head of Department	2	-	Exam	3	Pharm. Techn. I.
GYTKKA223	Pharmaceutical Technology Prescription Pharmacy I.	Pharmaceutical Technology Department	Dr. ERZSÉBET CSÁNYI associate professor	-	3	Term Mark	3	Pharm. Techn. I.
GYTKKA224	Pharmaceutical Technology Galenic Prep. and Their Manufacture	Pharmaceutical Technology Department	Dr. ERZSÉBET CSÁNYI associate professor	-	3	Term Mark	3	Pharm. Techn. I.
GYTKKA193	Pathophysiology II.	Pathophysiology Department	Prof. habil. GYULA SZABÓ professor, Head of Department	2	-	Exam	4	Pathophys. I., Immunology
GYTKKA194	Pathophysiology II.	Pathophysiology Department	Prof. habil. GYULA SZABÓ professor, Head of Department	-	2	S	0	Pathophys. I. (exam, pr.)
GYTKKA241	Biopharmacy	Pharmacodynamics Department	Dr. GÁBOR BLAZSÓ associate professor Dr. ISTVÁN ZUPKÓ assistant professor	2	-	Exam	2	Mathematics, Physiology II. exam, Biochemistry
GYTKKA242	Biopharmacy	Pharmacodynamics Department	Dr. ÁRPÁD MÁRKI assistant professor	-	3	Term Mark	2	Mathematics, Physiology II., Biochemistry
GYTKKA4□6	Hungarian Language VI.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	3	Term Mark	0	Hung. Lang. V.
	Elective Subjects							
GYTKKA□80	Computer Literature	Institute of Pharmaceutical Chemistry	Dr. ZSOLT SZAKONYI associate professor	-	1	Evaluation	2	-
Total:				**12**	**25**		**35**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 4th year fall, 7th semester								
	Compulsory Subjects							
GYTKKA261	Pharmaceutical Analysis	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	2	-	Exam	3	Pharm. Chem. II. (theory, practice)
GYTKKA262	Pharmaceutical Analysis	Institute of Pharmaceutical Analysis	Prof. habil. GYÖRGY DOMBI professor, Head of Department	-	5	Term Mark	4	Pharm. Chem. II. (theory, practice)
GYTKKA225	Pharmaceutical Technology III.	Pharmaceutical Technology Department	Prof. habil. PIROSKA RÉVÉSZ professor, Head of Department	2	-	S	0	Pharm. Techn. II.
GYTKKA226	Pharmaceutical Technology Prescription Pharmacy II.	Pharmaceutical Technology Department	Dr. ERZSÉBET CSÁNYI associate professor	-	5	Term Mark	5	Pharm. Techn. II., Prescr. Pharm. I.
GYTKKA22□	Pharmaceutical Technology Sterile and Aseptic Drug Formulations	Pharmaceutical Technology Department	Dr. ZOLTÁN AIGNER associate professor	-	3	Term Mark	3	Pharm. Techn. II.
GYTKKA251	Pharmacodynamics I.	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	3	-	Exam	3	Physiology II.,Pathophys. II., Biopharm.
GYTKKA252	Pharmacodynamics I.	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	-	3	Term Mark	2	Physiology II. (th., pr.), Pathophys. II., Biopharm. (th., pr.)
GYTKKA2□1	Public Health I.	Public Health Department	Prof. habil. LÁSZLÓ NAGYMAJTÉNYI professor,Head of Department	2	-	Evaluation	1	Physiology II. (th., pr.), Pathophys. II., Microbiology, Immunology
GYTKKA281	Ethics in Pharmacy	Department of Drug Regulatory Affairs	Dr. ILDIKÓ CSÓKA associate professor	2	-	Exam	2	Pharm. Techn. II.
GYTKKA291	Introduction to Law	Department of Drug Regulatory Affairs	Dr. ILDIKÓ CSÓKA associate professor	2	-	Exam	2	Pharm. Techn. II.
GYTKKA301	Introduction to Economy	Department of Drug Regulatory Affairs	Prof. TAMÁS PAÁL professor, Head of Department	2	-	Exam	2	Pharm. Techn. II.
GYTKKA4□□	Hungarian Language VII.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	2	Term Mark	0	Hung. Lang. VI.
	Elective Subject							
GYTKKA1031	Illicite Drug Use	Psychiatry Department	Prof. habil. GÁBOR BÁLINT professor	2	-	Exam	2	-
GYTKKA840	Communication in Pharm. Practice	Department of Drug Regulatory Affairs	Dr. ILDIKÓ CSÓKA associate professor	2	-	Evaluation	2	-
Total:				**19**	**18**		**31**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 4th year spring, 8th semester								
	Compulsory Subjects							
GYTKKA228	Pharmaceutical Technology IV.	Pharmaceutical Technology Department	Prof. habil. PIROSKA RÉVÉSZ professor, Head of Department	2	-	CE	4	Pharm. Techn. III.
GYTKKA229	Pharmaceutical Technology Prescription Pharmacy III.	Pharmaceutical Technology Department	Dr. JÁNOS BAJDIK assistant lecturer	-	3	Term Mark	2	Pharm. Techn. III., Prescr. Pharm. II.
GYTKKA595	Pharmaceutical Technology Tablet and Tablet Coating	Pharmaceutical Technology Department	ifj. Dr. PÉTER KÁSA assistant professor	-	3	Term Mark	2	Pharm. Techn. III.
GYTKKA596	Pharmaceutical Technology Investigation of Dosage Forms	Pharmaceutical Technology Department	Prof. habil. PIROSKA RÉVÉSZ Professor, Head of Department	-	4	Term Mark	3	Pharm. Techn. III.
GYTKKA253	Pharmacodynamics-Toxicology II.	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	3	-	Exam	3	Pharmacodynamics (th., pr.)
GYTKKA254	Pharmacodynamics-Toxicology II.	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	-	3	Term Mark	2	Pharmacodynamics (th., pr.)
GYTKKA2□2	Public Health II.	Public Health Department	Prof. habil. LÁSZLÓ NAGYMAJTÉNYI professor,Head of Department	2	-	Exam	3	Public Health I.
GYTKKA311	Drug Regulatory Affairs	Department of Drug Regulatory Affairs	Prof. TAMÁS PAÁL Professor, Head of Department	3	-	CE	6	Ethics in Pharm.;Intro. to Law, Economy
GYTKKA481	Clinical Laboratory Practice	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	2	-	Exam	2	Physiology II., Pathophys. II., Pharmacodynamics
GYTKKA482	Clinical Laboratory Practice	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	-	2	S	0	Physiology II., Pathophys. II., Clin. Lab. (th.)
GYTKKA991	Pharmacy Administration	Institute of Clinical Pharmacy	Dr. GYÖNGYVÉR SOÓS associate professor, Head of Department	-	1	Term Mark	2	Intro. to Law, Intro. to Economy
GYTKKA4□8	Hungarian Language VIII.	Department of Foreign Languages	Dr. ÉVA DEMETER language teacher, Head of Department	-	2	CE	0	Hung. Lang. VII.
	Elective Subjects							
GYTKKA511	Basic Clinical Pharmacology	Psychiatry Department	Prof. habil. GÁBOR BÁLINT professor	2	-	Evaluation	2	-
Total:				**14**	**18**		**31**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 5th year, 9th semester								
	Compulsory Subjects							
GYTKKA331	Fundamentals of Clinical Therapy	2nd Department of Internal Medicine	Dr. NOÉMI GRUBER associate professor	3	-	Exam	4	Phys. II., Pathophys. II., Pharmacodyn. II.
GYTKKA341	Clinical Pharmacy	Department of Clinical Pharmacy	Dr. GYÖNGYVÉR SOÓS associate professor, Head of Department	2	-	Exam	3	Pathophys. II., Biopharm., Public Health II.
GYTKKA255	Pharmacodynamics	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	3	-	CE	5	Pharmacodyn. II. (th., pr.)
GYTKKA256	Pharmacodynamics	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	-	3	Term Mark	2	Pharmacodyn. II. (th., pr.)
GYTKKA351	Pharmaceutical Care	Department of Clinical Pharmacy	Dr. GYÖNGYVÉR SOÓS associate professor, Head of Department	-	3	Term Mark	2	Pathophys. II., Biopharm.,Public Health II.
GYTKKA3□1	Natural Treatments	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	2	-	Exam	2	Phys.-Biophys. II., Pharmacognosy II., Pathophys. II., Pharmacodyn. II.
	Pharmacy Practice 1. (8 weeks)				40 hrs	Term Mark	6	
	Compulsory Elective Subjects							
GTYKKA461	Ward Pharmacy (Clinical Pharmacy II)	Department of Clinical Pharmacy	Dr. GYÖNGYVÉR SOÓS associate professor, Head of Department	2	-	Exam	2	Pathophys. II.Biopharm., Pharmacodyn. II.
GYTKKA451	Pharmaceutical Psychology	Psychiatry Department	Dr. TIBOR RUDISCH assistant professor	2	-	Exam	2	Physiology II., Pathophys. II., par: Pharmacodyn. III.
GYTKKA441	Tropical Medicine	Psychiatry Department	Prof. habil. GÁBOR BÁLINT professor	2	-	Exam	2	Physiology II., Pathophys. I.
GYTKKA321	Veterinary Pharmacy	Pharmacodynamics Department	Prof. habil. GYÖRGY FALKAY professor, Head of Department	2	-	Exam	2	Biopharm.
GYTKKA421	Quality Assurance	Department of Drug Regulatory Affairs	Prof. TAMÁS PAÁL Professor, Head of Department	3	-	Exam	3	Pharm. Techn. IV.
GYTKKA691	Human Genetics	Department of Medical Genetics	Prof. JÁNOS SZABÓ, professor, Head of Department	1		Exam	2	-
	Elective Subjects							
GYTKKA361	Computerized Dosage Form Planning	Pharmaceutical Technology Department	Dr. GÉZA REGDON, associate professor	-	2	Term Mark	2	-
GYTKKA5□1	Everyday Dermatology	Department of Clinical Pharmacy	Dr. GYÖNGYVÉR SOÓS associate professor, Head of Department	2	-	Exam	2	Pathophysiology
Total:				**24**	**8**		**41**	

SUGGESTED STUDY PLAN

Code of Subject	Course	Department	Lecturer	Hrs/week: Theory	Hrs/week: Practice	Form of exam	Credit	Course Requirement
PHARMACY								
2007/2008 5th year, 10th semester								
	Compulsory Subjects							
	Pharmacy Practice 2. (16 weeks)				40 hrs	Term Mark	18	
	Thesis					defence	10	
Total:							**28**	

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.

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
Flow of incompressible fluids. Flow of ideal fluids. Flow of viscous fluids. Laminar and turbulent flow. Intermittent flow in tubes with elastic walls. Non-Newtonian 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
Heat conduction. Heat convection. Heat radiation. Evaporation. Heat exchange between the human body and its environment. Medical applications of heat supply or extraction

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
Origin of membrane potentials. Diffusion potential. Determining the membrane potential experimentally. Resting potential. Action potential

The experimental basis of quantum mechanics
Laws of thermal radiation. Photoelectric effect. The Franck–Hertz experiment. The spectrum of the hydrogen atom. Particle-wave duality. Heisenberg's uncertainty principle

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
Special properties of laser radiation. Physical principles of laser operation. Laser types. Lasers in medical practice

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

Analysing signal shapes with a cathode-ray oscilloscope
Studying radioactivity with a Geiger–Müller tube
Determining the focal length of optical lenses
Determining the magnification and numerical aperture of a microscope
Measuring refractive index with an Abbe refractometer
Obtaining the absorbtion spectra of solutions with a spectrophotometer
Investigating emission spectra with a prism spectroscope
Studying optical activity
Investigation of heating and cooling kinetics
Amplifiers

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 Chistianity. 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 (iatrichemistry), 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.
Drug utilization: monitoring of drug consumption. Regulation and control of drug consumption. Tolerance, physical dependence and drug abuse.
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.
The development of drug control. Drug control and quality assurance (GMP, GLP, GXP). Drug trade and the drug supply in Hungary. Pharmaceutical societies and chambers.
International organization of health care. World Health Organization (WHO). International Red Cross (Red Crescent, Red Half-Moon). Commission of Narcotic Drugs. International Pharmaceutical Federation (FIP). International Federation of Pharmaceutical Manufactures Association (IPFMA). European Federation of Pharmaceutical Manufacturers Association (EPFMA).

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.

Limits, continuity, discontinuity: a graphical treatment with applications. Half-sided limits. Limit-arithmetic, undetermined limits and comparison of asymptotic decays.

Instantaneous growth rate, derivative: definition, general and geometrical meaning (speed, slope of tangent line, monotonicity), equation of the tangent line. Method of linearization and its applications. Second derivative, acceleration and concavity. Differentiation rules (sum, difference, product, quotient, chain rule, inverse f.). Examples. Derivatives of elementary functions. Graphical differentiation.

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.

Higher order derivatives. Approximation of functions around a point using the Taylor polynomial. Error term of the approximation. 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.

Differential equations in Pharmacy: basic properties, vector fields, initial value problems, equilibria, autonomous systems. Graphical study. Solution in case of separable right hand sides. Linear equations, exponential decay. Logistic equations. Some external effects and their meaning in life sciences. Equations of drug elimination, dosing, infusion, population dynamics. Systems of linear equations; compartmental systems in pharmacokinetics.

PRACTICALS

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

INFORMATICS

PRACTICE-1st smester (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.
3. Operating systems. Overview of distributed and real-time operating systems, multitasking. Computer networks: Novell Netware, Internet. Resource management, network communication.
4. Creating formatted documents; stand-alone and shareble versions. Compatibility problems. PDF files.
5. Manual and automatic text editing and formatting. The use of templates and styles.
6. Simple vs. complex documents in life sciences. Tables, charts, ClipArt, WordArt, hypertext.
7. Elements of desktop publishing. Paper and screen oriented versions.
8. **AUTUMN BREAK**
9. 1st practical test.
10. Data types in the pharmacological sciences. Number, date, time, money, dimensions, etc.
11. Practices on formulae, useful spreadsheet functions in life sciences.
12. Statistical evaluation and graphical presentation of medical/pharmacological data.
13. Slide presentation softwares.
14. 2nd practical test.
15. Computer aided measurement of bioelectrical signals. Data and image processing. Seeking medical/pharmacological Web-sites. Fine tuning of Internet browsers.

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.
Statistical estimation, confidence intervals. Testing hypotheses, significance. Errors in hypothesis tests. One-sample t-test, paired and Independent samples t-tests. One-way analysis of variance. Relationship between continuous variables, correlation, linear regression. Relationship between categorical variables: contingency tables and $\chi 2$ test, The $\chi 2$ test for goodness of fit. Nonparametric methods.

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:

Arnold Naiman, Robert Rosenfeld, Gene Zirkel: Understanding Statistics. McGraw-Hill International Editions, 1983.
Station A Glantz: Primer of Biostatistics. McGraw-Hill, 1992.
M.J.Campbell, D.Machin: Medical Statistics. John Wiley & Sons, 1993.

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:

Accomplishment	Practice evaluation
0-50 %	not met requirements (NOTMETRE)
51-90 %	met requirements /Passed (METRE/P)
90-100 %	met requirements /High mark (METRE/H)

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

Sum 200 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:

Accomplishment, %	Accomplishment, points	Exam evaluation
0 - 50 %	0-150 points	failed (1)
51-62.5 %	151-187.5 points	passed (2)
63-75 %	188-225 points	acceptable (3)
76 -90 %	226-270 points	good (4)
91-100 %	271-300 points	very good (5)

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GENERAL CHEMISTRY

1st semester

LECTURES

The science of chemistry

Chemistry as physical science. Measurements and units in chemistry.

The language of chemistry

Atoms, molecules and formulas. The law of constant composition. The law of multiple proportions. Chemical formulas and names. Balanced chemical equations. Important types of chemical reactions. States of substances. Net ionic equations. Energy changes in chemical processes.

Stoichiometry

States of matter

States of matter. Vapour pressure. The gaseous state. The ideal gas equation. Dalton's law of partial pressure. The kinetic theory of gases. Derivation of Boyle's law. Kinetic energy and temperature. Effusion and diffusion. Molecular speeds. Real gases. Critical phenomena.

The structure of atoms

The development of the atomic theory. The electron. X-rays and radioactivity. The nuclear atom. The development of the quantum theory. The photoelectronic effect. The Bohr model of the hydrogen atom. Waves and particles. The quantum mechanical description of the hydrogen atom.

Atoms, electrons, the periodic table

The quantum mechanical description of the hydrogen atom. Electronic configuration of multielectron atoms. Electrons in multielectron atoms. Ionization energy. Electron affinity. The periodic table of elements. Periodic trends in atomic sizes. A group trend exemplified: the alkali metals. Periodic trends in the oxides, hydrides and haloides of elements.

The chemical bond

Ionic bonds. The covalent bond. Electronegativity and bonding. Lewis structures. Resonance. Overlap of atomic orbitals. The molecular orbital method. Oxidation number. Weak interactions.

Molecular structure and stability

Molecular properties and geometry. Thermochemistry.

The properties of solutions

Terminology. Expressions of concentrations. Solubility. Vapour pressure of solutions. Boiling point and freezing point of solutions. Osmotic pressure. Solutions of electrolytes. Colloids.

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

Definitions of acids and bases. Strength of acids and bases. Acid and base strength and chemical structure. Acid and base reactions in aqueous solution. Weak acids and weak bases. Neutralization and titration. Buffers. Polyprotic acids.

Oxidation-reduction

Oxidation-reduction reactions. Oxidation-reduction processes in aqueous solution. Electrolysis and Faraday's laws. Galvanic cells. Cell potentials. Electrode potentials. Potential and concentration. The nernst equation. Some important electron transfer processes.

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

Structure of coordination compounds. Isomerism of coordination compounds. Bonding of coordination compounds. Lability and stability of coordination chemistry. Complex ions in aqueous equilibria. Some applications of coordination chemistry.

PRACTICALS

Chemical calculations

The properties of gases. Concentration of solutions. The physical properties of solutions. Thermochemistry. Stoichiometry. Electrochemistry. Chemical equilibrium. Chemical equilibrium in solutions. Rate of chemical reactions.

Laboratory experiments

Separation of NaCl-$CaCO_3$ 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.
Determination of the equivalent mass of zinc. Titration of NaOH solution with oxalic acid solution.
Preparation of different types of chemical compounds. Preparation of a double salt.
Study of 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 $KMnO_4$.
Oxidation reactions by Fe(III) ions. Oxidation reaction by H_2O_2.
Effect of concentration on the rate of reaction. Oscillating reactions. Temperature dependence of reaction rate. Effect of catalysts on reaction rate.
Equilibrium constant. Hydrolysis of salt. Effect of temperature on the hydrolysis. Buffer solutions. Solubility of NaCl.

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.

Classification of the elements based on the periodic table. Physical properties of the elements. Occurrence of the elements, isotopes. Synthesis and purification of the elements. General reaction routes of the elements.

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 (glasses). 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 oxyde; 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; hemoglobine).

RARE EARTH METALS

General physical and chemical properties, electron configuration, occurrence, synthesis, use of them, important compounds (Ce-oxydation; 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).

BROMINE AND IODINE

Their place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of them. Solvatation of iodine. Their chemical properties, reactions, synthesis and use of some important compounds containing them (bromine water; hydrogen bromide, bromides-sedatives; oxoacids and salts; iodine solutions; pseudohalogenides; biological importance of iodine).

OXYGEN

Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it. Water (natural-, deionised, distilled water; physical properties; water as solvant). Its chemical properties, reactions, synthesis and use of some important compounds containing it. Substances for oxydation (peroxides, permanganates, chlorine water, iodine etc.)

SULFUR

Its place in the periodic table, electron configuration, physical properties, occurrence, synthesis and use of it (ozone, natural, deionised and 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).

NITROGEN

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 (ammonia, ammonium salts; oxides; acids; hydrazine; carbamide; azides).

PHOSPHORUS

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, acids, salts and their biological importance).

CARBON

Its place in the periodic table, electron configuration, physical properties, isotopes of carbons, occurrence, synthesis and use of it (charcoal). Its chemical properties, reactions, synthesis and use of some important compounds containing it (carbides; carbon monoxide; carbon dioxide; acids; carbonates; hydrogen-carbonates; antacid substances).

PHARMACEUTICAL BIOLOGY

1st semester

LECTURES

The essence of life

Definition of life. Features of the living things. Difference between living and non-living. Cybernetic basis of life.

The chemical basis of life

Isotopes. Radioactive isotopes. Molecules. Chemical bonds. Carbon. Biogenic elements. Organic compounds. Carbohydrates. Lipids. Proteins. Nucleic acids.

The cellular basis of life

Eukaryotes and prokaryotes. Hyaloplasm. Granuloplasm. Endoplasmic reticulum and ribosomes. Mitochondria. The Golgi apparatus. Lysosomes (phagosomes, primary and secondary lysosomes, post-lysosomes). Peroxysomes. Centrioles. The nucleus. The karyolympha. The chromatin. Control of the chromatin activity.

Cell division

The cell cycle. Mitosis. Interphase. Prophase. Metaphase. Anaphase. Telophase.

Meiosis

First meiotic prophase. Leptotene. Zygotene. Pachytene. Diplotene. Diakinesis. Anaphase I. Telophase I. The second meiotic division.

The genetic make-up of the cell

The Watson-Crick model. DNA duplication (DNA polymerase, template, repair, nucleosomes). Protein synthesis. Transcription. Translation. Reverse transcription. Genetic engineering (manipulation).

Reproduction

Asexual reproduction. Sexual reproduction. Spermatogenesis. Oogenesis. Fertilization. Bacterial conjugation.

Ontogenesis and differentiation

Branchyostoma lanceolatum. Sauropsides (reptiles and birds). Mammals and man. Experiments on the embryonic development. Differentiation.

Human genetics

Classical genetics. Mendelian inheritance. Dihybrid patterns of inheritance (gene interaction). Double dominance. Alternating genes. Complementary genes. Dominant genes with similar effect. Recessive epistasis. Dominant epistasis. Man as a subject of genetic studies. Analogy. Family studies. Twin studies. Correlation analysis. Cytogenetic analysis. Examination of the interphase nuclei. Chromosomal analysis and cytogenetics. Mendelian inheritance in man. Dominance. Eye color. Hair color. Skin color. Eye shape. Nose shape. Mouth shape. Hair form.

Dominant inheritance in human diseases

Penetrance. Expressivity.

Basic mechanisms in the formation of dominant disorders

Abnormal subunit agregation (dysfibrinogenemias). Functional impairment of a multimer protein due to an abnormal subunit (hemoglobinopathies). Sickle-cell anemia. The clinical effects of hemoglobin variants. Hemolytic anemia. Methemoglobinemia. Erythrocytosis. Sickling of the erythrocytes. Thalassemias. Abnormal feed-back inhibition of enzymes by structurally altered enzymes (acute intermittent porphyria). Receptor mutations (androgen resistance and hereditary hypercholesterolemia). LDL syndrome. Membrane defects (hereditary sphaerocytosis). Accumulation of abnormal fibrillar proteins (hereditary amyloidoses).

Recessiveness

Diseases in the phenylalanine-tryosine pathway. Failures of the erythrocytic enzymes. Mucopolysaccharidoses. Glycogenoses. HGPRT deficiency.

Pharmacogenetics

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

Multiple alleles

Inheritance of ABO blood groups

X-linked inheritance

Color blindness. Hemophylia. Duchenne muscular dystrophy. Other X-linked recessive diseases. X-linked dominant conditions. Y-linked inheritance.

Polygenic (multifactorial) inheritance

Population genetics

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

Human cytogenetics

The normal human idiogram. Human chromosomal abnormalities. Numerical chromosomal abnormalities. Autosomal aneuploidies. Trisomy 1. (Patau's syndrome). Trisomy 18. (Edward's syndrome). Trisomy 21. (Down's syndrome). Sex-chromosomal aneuploidies. Sex-chromosomal aneuploidies with female phenotype. X monosomy (Turner's syndrome). X

trisomy (triple-X syndrome). Sex-chromosomal aneuploidies with male phenotype. XXY males (Klinefelter's syndrome). XYY males (Double-Y syndrome).

Structural chromosomal abnormalities
Intrachromosomal rearrangements
Deletions. Inversions. Insertions. Ring chromosomes. Duplications.
Interchromosomal rearrangements
Translocations
Mutations
Gene mutations. Chromosomal mutations. Genome mutations. Somatic mutations.
Human cytogenetic methodology
Sex-chromatin. Chromosomal studies. Banding techniques. □-banding. G-banding. R-banding. R-banding. C-banding. T-banding. NOR staining. Chromatid exchange studies. High resolution banding.
Human gene mapping
Cell hybridization. Microcell-mediated transfer of chromosomes. Endocytotic uptake of donor chromosomes (restriction enzymes).
Genetic engineering
Somatic cell alteration. Germ cell alteration. Predetermination (and control) of the sex. Cloning of human cells. Artificial insemination from donors. Embryo transfer (test-tube baby).

PRACTICALS

Inspection of cycle praparatory 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

The social organization. Reproduction (propag.rejuven.recomb.) Sexuality (bipolarity, relative sexuality, bisexual potency) Sexual dimorphism (I.-II.-III.-IV.) features. The female gonad and genital tract.
The ovarian cycle. Knaus Ogino. The male gonad and genital tract. Ejaculation. The maturation of ova and sperm. The structure of the sperm. The effect of sex-hormones in animals and humans.
Fertilization. The helper mechanisms. Gamones. Cellular processes of fertilization. Contraception. Male and female infertility. IVF as means of overcoming female infertility.
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.
Parasexual process. (Phage recomb., Transformation, Transduction, Bacterial conjugation) Ontogenesis. (Progenesis, Blastogenesis, Organogenesis) The yolk (oligo-meso-polylecyth. eggs) The embryonic development of the Branchiostoma. The ancient organs (ectoderm, neural tube and notochord derivatives)
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.
Organization and induction in the embryonic development. Prospective potency and prospective meaning. Experiments on embryos. Genetics. Ideal organisms vs. human being in genetic studies. How to overcome these difficulties. Human genetic meyhodology.
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.
Multifactorial (polygenic) inheritance. Cytogenetics. Sex-chromatin, preparation of chromosomes.
Cytogenetic disorders. Numerical and structural chromosomal diseases.

ANATOMY

1st semester (15 weeks)

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

2nd semester (15 weeks)

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

QUALITATIVE CHEMICAL ANALYSIS

Concepts, aims and general methods. Ions.
Classification of reactions.
Redox reactions. (Oxidation number /oxidation state/. Oxidation and reduction.) Acid-base reactions. Reactions involving precipitation. Complex-formation reaction (Complex cations. Complex anions. Neutral complexes. Chelates.)
Reaction sensitivity
Reaction specificity
Groups of cations
Group 1: Hydrogen sulphide group. Group reaction. Reagents. General characterization of group 1.
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(I), 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 test. 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.
Group 3 (ammonium sulphide group): Group reaction. Reagents. Cobalt(II), reaction with ammonium sulphide, alkali hydroxides, ammonia, cyanides, thiocyanates, nitrites, Borax-bead test. Nickel(II), reaction with ammonium sulphide, ammonia, alkali hydroxides, cyanides, dimethylglyoxime. Iron(II), reaction with ammonium sulphide, alkali hydroxides or ammonia, hexacyanoferrate(III), α,α-dipyridyl, permanganate. Iron(III), reaction with ammonium sulphide, hydrogen sulphide, ammonia or alkali hydroxides, sodium acetate, hexacyanoferrate(II), thiocyanate, iodides. Chromium(III), reaction with ammonium sulphide, ammonia, alkali hydroxides, hydrogenperoxide. Oxidation to chromate in melt phase. Chromate, reaction with sulphides, ethanol, silver ion, barium ions, peroxichromate reaction. Aluminium(III), reaction with ammonium sulphide, ammonia, alkali hydroxides, alizarinsulphonate, Thénard-blue test. Zinc(II), reaction with ammonium sulphide, ammonia, alkali hydroxide, hexacyanoferrate(II), Rinmann-green test. Manganese(II), reaction with ammonium sulphide, ammonia or alkali hydroxides. Oxidation to permanganate with lead(IV). Oxidation to permanganate with persulphate. Oxidation in the melt phase. Permanganate, reaction with sulphides, peroxides, ethanol.
Simple analysis of cation group 3.
Group 4, alkaline earth (ammonium carbonate) group: Group reaction. Reagents. Calcium(II), reaction with ammonium carbonate and carbonates, sulphates, oxalates, phosphates, hexacyanoferrate(II), chromate. Visible spectrum. Strontium(II), reaction with ammonium carbonate and carbonates, sulphates, lime water, oxalate, phosphates, chromate. Visible spectrum, flame coloration. Barium(II), reaction with ammonium carbonate and carbonates, sulphates, calcium or strontium sulphate, oxalates, phosphates, chromate or dichromate. Visible spectrum, flame coloration.
Simple analysis of cation group 4.
Group 5, magnesium and alkali metal group (soluble group): Group reaction. Magnesium(II), reaction with ammonia, alkali hydroxides, ammonium carbonate, phosphates, quinalizarine. Sodium(I), reaction with antimonate, zinc uranylacetate. Visible spectrum, flame coloration. Potassium(I), reaction with tartaric acid, hexanitrocobaltate(III), perchloric acid, tetraphenylboron. Visible spectrum, flame coloration. Ammonium(I), reaction with tartaric acid, hexanitrocobaltate(III), tetraphenylboron, strong bases, Nessler reaction. Lithium(I), reaction with ammonium carbonate, phosphates. Visible spectrum, flame coloration.
Simple analysis of cation group 5.

Groups of anions.
Group 1: Carbonate, reaction with acids, hydrolysis (phenolphthalein), magnesium sulphate. Hydrogencarbonate, reaction with acids, hydrolysis, magnesium ions. Sulphite, reaction with acids, barium ions, silver ions, iodine. Thiosulphate, reaction with acids, silver ions, iodine. Heating in flame. Sulphide, reaction with acids, nitroprusside, Hepar-reaction. Polysulphide, reaction with acids. Silicate, reaction with dilute acids, molybdate. Tetrafluoride test. Hypochlorite, formation and reaction with acids.
Group 2: Group reaction. Sulphate, reaction with barium ions, lead ions, Hepar reaction. Water-insoluble sulphates. Phosphate, reaction with barium ions, silver ions, magnesia mixture, molybdates. Borate, reaction with barium ions, silver ions. Turmeric paper reaction. Flame coloration. Fluoride, reaction with barium ions, calcium ions, silver ions, sulphuric acids, thiocyanates. Tetrafluoride test. Bromate, reaction with barium ions, silver ions, bromides, concd. hydrochloric acid, metallic zinc. Iodate, reaction with barium ions, silver ions, iodides, concd. hydrochloric acid, metallic zinc.

Group 3: Group reaction. Chloride, reaction with silver ions, Chromyl chloride reaction, Berg reaction, oxidative agents. Bromide, reaction with silver ions, chlorine water, permanganate. Iodide, reaction with silver ions, chlorine water, iron(III) ions, oxidants.

Cyanide, reaction with silver ions, hexacyanoferrate(II) reaction, acids (HC1), iodine or bromine. Thiocyanate, reaction with silver ions, iron(III) ions.
Group 4: Group reaction. Nitrate. Brown-ring test. Reduction with metallic zinc in alkaline medium. Nitrite, reaction with strong acids, iron(II) ions, Griess-Ilosvay reaction, urea, permanganate oxidation, iodide, metallic zinc. Acetate, reaction with strong acids, iron(III) ions. Esterification. Decarboxylation with calcium oxide. Chlorate, reaction with strong acids, disproportionation by heating, concd. sulphuric acid, iodides, metallic zinc. Perchlorate, reaction with iodides, metallic zinc, potassium ions. Methylene blue reaction.
Total analysis of solids for cations and anions: physical appearance, color, preliminary tests, heating, flame coloration, preparation of solution, analysis for cations and anions.
Identification of anions in mixtures: Chloride, bromide and iodide. Chloride and iodide. Bromide, iodide and nitrate. Nitrite and nitrate.

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 pracipitates. 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.
Principles of titrimetric methods. Volumetric glassware and their calibration. Preparation and standardization of titrants. End-point determination techniques in titrimetry. Calculation of results, error calculation and their sources.
Acid-base theories, ionization of strong and weak acids, bases and their salts, calculation of pH. Classification and characterization of solvent used in acid-base titration. Construction of titration curves. Detection of end-point, mechanism of indication, indicator exponent. Preparation and standardization of titrants in acid-base titration. Titration of strong and weak acids, bases and their salts. Titration of alkali carbonate, bicarbonate and hydroxide mixture. The hardness of natural waters. The role of acid-base titrationin analysis of trigycerids (fats and oils). Acid-base titration in nonaqueous solution.
Principles of precipitate forming titration. Calculation of solubility and construction of titration curves. End-point detection methods in precipitate forming titration. Preparation and standardization of silver nitrate titrant. Determination of silver ions, halogenides and pseudohalogenides.
Complex equilibrium in analytical chemistry, theory of complexometric titration. Influence of pH and the presence of other complex forming reagents on stability of complexes. The selectivity of complex forming titration. Indication of end-point by visual and instrumental methods. Preparation and standardization of EDTA solution. Direct, indirect and back titration in complexometry. Determination of hardness of waters.
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 factorsin 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 brominechloride.
Preparation and standardization of iodine and sodium-thiosulfate standard solution. End point indication in iodometry and iodimetry. pH dependence on iodometric titrations. Determination of oxidizing agents; titration of halogens, hypohalogenides, halogenites, halogenates and metallic oxides. Determination of dissolved oxygen in waters. Determination of reducing agents; titration of sulfides, sulfites, aldehydes, saccharides. Water determination by Karl Fischer methods.
Reductometric methods; titanometry, ascorbinometry.
Instrumental methods of chemical analysis, classification and importance of instrumental analysis.
Electrochemical methods; potentiometry (membrane-type and special electrodes) and potentiometric titrations, electrolytic methods (polarography, volt-ammetric titrations), coulombmetry and measurements based on electric conductivity.
Spectrometric methods in instrumental analysis, interaction of electromagnetic radiation with matter. General rules of light absorption and emission. Excitation methods in atomic emission spectroscopy. Principles and applications of atomic absorption. Ultraviolet visible and infrared spectrophotometry. Fluorometric methods.

Separation methods of instrumental analysis. Principles and applications of gas chromatography, high performance liquid chromatography and ionchromatography.
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 $BaSO_4$.
- Gravimetric determination of and calcium ion sin form of $CaC_2O_4*H_2O$.

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 amonium salts by destilation.
- 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.

Date	Themes	Teacher(s)
8. Feb.	The principles of first aid and emergency situation. Constantin's cross. Victim assessment. Rescuing technique.	
15. Feb.	Rautek's manoeuvre, log-roll technique, KED, paramedic-EMC-NIC introducing, helmet removing.	
22. Feb.	Unconscious patients, BLS, XBLS, AED	
1. March	Unconscious patients, BLS, XBLS, AED – practice	
8. March	Obstructed airway emergencies. Choking. Submersion. Respiratory distress.	
22. March	Heimlich manoeuvre. Stable position (Gabor's manoeuvre). Esmarch-Heiberg manoeuvre. Laryngeal mask, ET.	
29. March	Bleeding. Mechanism of injuries (joints, bones). Pain relief. Recognition of patients with shock conditions.	
12. April	Capeline bandage. Dessault dressing. Art. pressure points. Art. pressure bandages. Venous pressure dressings. Stifneck, VM, pneumatic splints. Scoop strecher.	
19. April	Mechanism of injuries. Type of wounds. Burn injuries. Electrical accident.	
26. April	Rescuing technique. First aid technique.	
3. May	Recognition of poisoning. First aid on the scene.	
10. May	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.	
17. May	Final examination.	

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/.
The Rákosi regime /1948-1953/. Soviet model in Hungary.
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.

ENGLISH

1st semester (15 weeks)

WEEK	**PRACTICE**
	(4 hrs/week)
1.	Introduction and group discussion. Interviewing: asking and answering Yes/No and Wh-questions.
2.	Reading comprehension: skimming texts, understanding the essence of texts. Reading and discussing articles about hot issues on diseases and their cures.
3.	Vocabulary expansion, reading about recent advances in pharmacology. Video watching and discussion on the same topic.
4.	Writing tasks: how to write an essay/composition. Briefing task: reading a longer text (n=1500) on chemistry and summarizing it in 500 words. The use of connectors in writing.
5.	Listening skills: listening to a recording on vitamins and their effects, note taking exercise. Practising the Passive Voice.
6.	Speaking skills: preparing talks and mini-presentations. Paraphrasing and the use of references in presenting mini-projects. The use of Modal Verbs.
7.	Revision of the Past Simple and the Present Perfect Tenses. Presenting research methods and results. Mid-term test.
8.	Guided note taking. Listening to a recording on pathogens and taking notes. Comparing and discussing notes. Identifying main points. Semantic markers.
9.	**AUTUMN BREAK**
10.	Reading skills: preparing study notes from lengthy texts, identifying most important facts. Description, cause and effect. Understanding and memorizing definitions.
11.	Focussing on grammar and vocabulary expansion: CFC practice tests and health vocabulary tests.
12.	Video-watching: eating disorders – anorexia, bulimia and binge eating. Summarizing the film in writing and giving opinion on the topic. The use of definite and indefinite articles.
13.	Preparing short oral presentations on harmful habits. Arguing and defending viewpoints. Preparing for discussions. Indirect speech.
14.	Guided note taking. Listening to a recording on constipation and its cures. Developing patient advice leaflets from notes.
15.	Vocabulary and grammar revision. Practice tests. Final test.

2nd semester (15 weeks)

WEEK	**PRACTICE**
	(4 hrs/week)
1.	Organizing written notes and identifying main points. Lecture notes taken from Biology. Commonly used abbreviations and their interpretation.
2.	Video watching: psoriasis and its treatment modalities. Medicaments used externally. Group discussion of a video film, arguing and convincing.
3.	Essay writing on the importance of the pharmacist in giving advice on a healthy diet. Suggestions and recommendations. The use of MUST/SHOULD/WOULD.
4.	Reading skills: developing faster reading and deeper understanding of read texts. Accomplishing reading comprehension tasks. CAE Reading Test.
5.	Vocabulary expansion: preparing word-nets concerning internally used medicines. Adjectives, Comparatives and Superlatives.
6.	Making use of the Internet in class: searching the Net for information on certain health issues. Presenting ideas found on the Net. Group discussion and evaluation.
7.	Revision of Future Tenses and expressions meaning intension and certainty in the future. Describing expected and adverse effects of drugs. Mid-term test.
8.	Developing awareness of proper and improper sentence constructions, grammar and vocabulary. Error spotting in essays written by group mates.
9.	Clear and concise writing. How to make our writing more effective? Practising short essay writing, analysing problems of English from in biology and chemistry texts. Repetition and reformulation of ideas.
10.	**SPRING BREAK**
11.	Reading and understanding Tables. Numericals, decimals, reading out numbers.
12.	Reading and presenting graphs. The Conditional Mood. Vocabulary expansion: preparing word-nets concerning shapes.
13.	Vocabulary expansion: English words of Greek and Latin origin in the field of Pharmacy. Prefixes and suffixes giving oppositional meaning to adjectives and adverbs.
14.	Listening and writing skills: listening to a recording on the drug industry and taking notes. Comparing and discussing notes. Defining and non-defining relative pronouns.
15.	Vocabulary and grammar revision. CAE and Medical Practice tests. Final test.

LATIN

1st semester (15 weeks)

WEEK	**PRACTICE**
	(2 hrs/week)
1.	The role of the Latin language in medicine and pharmacy. Pronunciation. Groups of nouns - typical forms. Noun-adjective agreement, grammatical gender.
2.	1st declension. Noun-adjective agreement, grammatical gender. Cases. Preas. Imp. Activi form of Latin verbs.
3.	Simple medicine forms. Plural forms in 1st declension..Prepositions.
4.	Praes. Imp. Passivi. 2nd declension.
5.	Grammar revision excercises. Ointment, oil.
6.	Mid-term test. The stucture of medical prescriptions. 3rd declension - nouns.
7.	3rd declension - adjectives. Prepositions. Medicine forms.
8.	The structure of medical prescriptions. Abbreviations. Cardinals in prescriptions. Miscellaneous exercises. Cardinals - "gramma".
9.	**AUTUMN BREAK**
10.	4th declension.
11.	Herbal teas. 5th declension.
12.	Comparison of adjectives.
13.	Participles in the pharmaceutical language. Herbs and plants.
14.	Revision.
15.	Final test.

SYLLABUSES FOR 2ND YEAR PHARMACY STUDENTS

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 pracipitates. 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.
Principles of titrimetric methods. Volumetric glassware and their calibration. Preparation and standardization of titrants. End-point determination techniques in titrimetry. Calculation of results, error calculation and their sources.
Acid-base theories, ionization of strong and weak acids, bases and their salts, calculation of pH. Classification and characterization of solvent used in acid-base titration. Construction of titration curves. Detection of end-point, mechanism of indication, indicator exponent. Preparation and standardization of titrants in acid-base titration. Titration of strong and weak acids, bases and their salts. Titration of alkali carbonate, bicarbonate and hydroxide mixture. The hardness of natural waters. The role of acid-base titrationin analysis of trigycerids (fats and oils). Acid-base titration in nonaqueous solution.
Principles of precipitate forming titration. Calculation of solubility and construction of titration curves. End-point detection methods in precipitate forming titration. Preparation and standardization of silver nitrate titrant. Determination of silver ions, halogenides and pseudohalogenides.
Complex equilibrium in analytical chemistry, theory of complexometric titration. Influence of pH and the presence of other complex forming reagents on stability of complexes. The selectivity of complex forming titration. Indication of end-point by visual and instrumental methods. Preparation and standardization of EDTA solution. Direct, indirect and back titration in complexometry. Determination of hardness of waters.
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 factorsin 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 brominechloride.
Preparation and standardization of iodine and sodium-thiosulfate standard solution. End point indication in iodometry and iodimetry. pH dependence on iodometric titrations. Determination of oxidizing agents; titration of halogens, hypohalogenides, halogenites, halogenates and metallic oxides. Determination of dissolved oxygen in waters. Determination of reducing agents; titration of sulfides, sulfites, aldehydes, saccharides. Water determination by Karl Fischer methods.
Reductometric methods; titanometry, ascorbinometry.
Instrumental methods of chemical analysis, classification and importance of instrumental analysis.
Electrochemical methods; potentiometry (membrane-type and special electrodes) and potentiometric titrations, electrolytic methods (polarography, volt-ammetric titrations), coulombmetry and measurements based on electric conductivity.
Spectrometric methods in instrumental analysis, interaction of electromagnetic radiation with matter. General rules of light absorption and emission. Excitation methods in atomic emission spectroscopy. Principles and applications of atomic absorption. Ultraviolet visible and infrared spectrophotometry. Fluorometric methods.
Separation methods of instrumental analysis. Principles and applications of gas chromatography, high performance liquid chromatography and ionchromatography.
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
  cerimetric titration of iron(II)-ion by potentiometric end point indication
- Voltametry: iodometric titration of iodate by byamperometric end point detection
- Chromatograpy: 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
- Iontransport

Reaction kinetics

PRACTICALS

Thermochemistry
- Determination of the heat of neutralization.

Phase equilibria
- Determination of vapour pressure and heat of vaporisation of a liquid. Determination of the partial molar volume. Solubility relations in a three component system. Determination of boiling point diagram of two component miscible liquids. Partition experiments. Solubility measurements of solid substances.

Reaction kinetics
- Temperature dependence of the decomposition of a medicine. The kinetics of the hydrolysis of methyl acetate. The study of catalysis, promotion and inhibition. Primary salt effect on the kinetics of ionic reactions. Study of the kinetics of the decomposition of benzene-diazonium-chloride. Determination of initial rate and order of a reaction by clock reaction.

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

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

Experiments based on optical methods
- Dependence of light refraction on the concentration. Study of absorption spectrum of solutions. Study of inversion of cane sugar by polarimetry. Study of complexes by spectrophotometry.

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.
Alkanes and alkyl groups. Conformation of alkanes. Cycloalkanes: cis-trans isomerism.
Alkenes: the nature of organic reactions.
Electronic structure of alkanes. The E,Z designation kinds of organic reactions: mechanisms, rates and equilibria.
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.
Synthesis and reaction of aldehydes and ketones. Nucleophilic addition of H2O, of Grignard reagents and of amines.
Carboxylic acids and derivatives
Synthesis and reactions of carboxylic acids. Chemistry of acid 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

Recording techniques, recording devices: kimograph, computer. Methods of stimulation: thermal, chemical, electrical, types of electrodes. Video. Dissection of the frog: anaesthesia, decapitation, lesioning of the spinal cord, movements of cilia (frog's palate), heart, organs in the abdomen, m. sartorius preparation, m. gastrocnemius nerve-muscle preparation. Solutions used in physiological experiments.

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-), detrmination 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)
GI tract: The pH of the saliva. Detection of proteins in saliva. Demonstration of amylase and maltase activities in the saliva. Detection of lactic acid in gastric juice. Demonstration of the protein digesting activity of pepsin. Measurement of acidity of gastric juice. Analysis of feces: color, smell, pH etc. Microscopic examination of the feces. Detection of blood in feces. Studies on gastric acid and bile secretion in rats. Demonstration of the movements of the small intestine according to Magnus' method.
Urine analysis I.: Color, smell, transparency and pH. Microscopic investigation of the urinary sediment. Specific gravity. Detection of UBG (Ehrlich's method). Detection of calcium (Sulkowitsch' test). Detection of sugar (Nylander's and Fehling's tests). Detection of protein (Heller's test, boiling test, sulphosalicylic acid test). Detection of blood (benzidine test). Detection of acetone. Detection of bile pigment. Detection of pus (principle). Rapid strip tests. Video (kidney).
Urine analysis II.: Demonstration of the effect of ADH on urine output. Dilution and concentration test in human (principle). Counting corpuscular elements in urine (Addis' method). Determination of clearance (principle). Analysis of an unknown urine sample.
Human reflexes. Patella-, Achilles-tendon, biceps-, triceps-, radial-reflex. Skin reflexes. Reaction time. Tremor. Demonstration of blood-brain barrier in the rat. EEG. Chronically implanted EEG-electrodes in rats. Computer program (EEG). Video (Development of the motor system of a baby, EEG).
Motor functions of intact frog. Posture and locomotion. Righting-, compass- and cornea-reflex. Motor functions of the spinal frog. Spinal shock and muscular tension. Wiping-reflex. Hugging-reflex. Reciprocal innervation. Protective (flexor-) reflex. Reflex-irradiation. Stimulus summation. Analysis of the reflex-arc. Determination of reflex-time. Reflex hyperresponsiveness after strychnine.
Sensory organs I.: Visual acuity. Correction of faults of refraction (principle). Accomodation. Mariotte's blind-spot test. The light-response of the pupil. Testing of color blindness. Perimetry. Ophthalmoscopy. Dark adaptation. Purkinje-Sanson's images. Fusion frequency. Nystagmus. Detection of astigmatism (Placido's keratoscope, Javal-schiötz'-ophthalmometer). Visual evoked potentials (computer program).
Sensory organs II.: Laryngoscopy, otoscopy. Acoustic acuity (drop-test, audiometry). Tests with tuning fork (examinations according to Rinne, Schwabach and Weber). Bárány's pointing test. Olphactometry. Tests of somatosensations (pressure, pain, tactile sense etc.). Video (Vision, inner ear).
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.
- Adsorbents.
- 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 precursosrs: 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, gynoceum, 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, Juglandeceae, Caryophyllaceae, Polygonaceae, Tiliaceae, Malvaceae, Brassicaceae, Primulaceae, Rosaceae, Fabaceae, Myrtaceae, Celastraceae, Rhamnaceae, Rutaceae, Linaceae,Geraniaceae, Apiaceae, Caprifoliaceae, Valerianaceae, Boraginaceae Lamiaceae, 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 dicotyledonoous stems
Barks
Foliage Leaves
General structure of foliage leaves
Christals with diagnostic importance in clarified leaves
Fruits and Seeds
Cremocarp, hesperidium fruit, berry
Hystology of seeds
Taxonomy
Charactersation 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

PHARMACEUTICAL PROPEDEUTICS

4th semester (15 weeks)

WEEK	**Lecture (2 hrs/week)**
1.	Definition of drugs, classification of drugs. Active substances, additives, pharmaceutical preparations, dosage forms
2.	Medical prescription. History of medical prescription, part of prescription, legal condition-system of prescription writing
3.	Types of drug order (formula magistralis, formula normalis, formula originalis, formula officinalis, fordmula nosocomialis
4.	Pharmacies. Types of phramacies (public pharmacy, branch pharmacy, 'hand' pharmacy, hospital pharmacy). Establishment of pharmacies,equipment and fittings in pharmacies, function of pharmacies
5.	Pharmacopoesas I.Functions and structures of pharamcopoeas. Hungarian Pharmacopoea Ed. VII. and VIII.
6.	Pharmacopoeas II. European Pharmacopoea Ed 4-5!. American and British Pharmacopoeas. National Formulary,Prescriptiones Magistrales
7.	Dosage forms in pharmacopoeas (solid, loquid and semisolid dosage forms, human and veterunary medicines, classification of dosage forms according to application place. ATC code
8.	**SPRING BREAK**
9.	Institutional pharmacy (hospital and clinic pharmacy).Basic activity and professional activity in hospital pharmacies
10.	Industrial pharmacy. Characteristics of industrial preparation of dosage forms. Good manufacturing Practice
11.	Drug research(Phase 0, PhaseI., Phase II., Phase III., Phase IV.) Pharmaco-economic investigation, investigations of quality of life
12.	Registration of drugs. Patents, listed medicines, generic medicines
13.	Public health, social insurance. Ministry of helath. Organisations of pharmacy (Sociiety of Pharmaceutical Sciences, Pharmaceutica lChamber). WHO, FIP, EUFEPS

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 metabolits. 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, occurence, uses (in medicine) of carbohydrates.
Honey, Tamarin pulp, manna, fig.
Rose fruits.
Starches.
Gums and mucillages. Tragacantha, acacia gum, agar, cotton.
Carragen, steraculia 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.
Krebs cycle. Amino acids. Peptides.
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.
□uillaya bark, liquorice.
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.
Hyoscyamus leaf. Egyptian Henbane. Belladonna herb and root.
Stramonium leaf. Duboisia leaves. Coca leaf and Cocaine.
Lysine-derived alkaloids. Lobelia. Tobacco alkaloids.
Phenylalanine-derived alkaloids. Ephedra.Khat. Opium poppy. Opium.
Hydrastis.Ipecacuanha. Colchicum seed and Corm.
Triptophan-derived alkaloids. Ergot. Calabar bean. Nux vomica. Rauwolfia.
Catharanthus roseus. Cinchona. Imidazole alkaloids. Jaborandi leaf.
Purine alkaloids. Coffee seed. Thea. Cocoa seed. Maté leaf. Cola. Guarana.
Phenols and phenolic glycosides. Phloroglucinol-derivatives.
Male fern. Anthraquinones and glycosides. Senna leaf. Cascara bark.
Frangula bark. Rhubarb. Aloes. Flavonoid compounds. Silybum. Sambucus.
Tannins. Galls and tannic acid. Hamamelis. Catechu. Rhatany.
Coumarins and their glycosides. Visnaga. Lignans. Podophyllum and Podophyllum resin.
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 chlorate, 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.
Nitrogen group. Nitrogen, Concentrated ammonia solution, Ammonium chloride, Ammonium bromide, Nitrous oxide, Sodium nitrite, Concentrated nitric acid, Potassium nitrate.
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

Inhalation anaesthetics. Nitrous oxide, Ether, Ethyl Chloride, Chloroform, Trichloroethylene, Ethylene, Cyclopropane, Vinyl Ether, Halothane, Methoxyflurane, Enflurane, Isoflurane.
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.
Ureides. Bromisoval, Carbromal.
Barbiturates. Chemical characteristics, Analysis of barbiturates, Structure-activity considerations, Synthesis of barbiturates, Biotransformation of barbiturates, Barbital, Phenobarbital, Butobarbital, Amobarbital, Pentobarbital, Allobarbital, Cyclobarbital.
Benzodiazepine derivatives. Nitrazepam, Flunitrazepam.
Other derivatives. Methaqualone, Glutethimide, Thalidomide

Anticonvulsant drugs

Barbiturates Phenobarbital.
Pyrimidinediones Primidone.

Hydantoins. Phenytoin, Mephenytoin.

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.
Morphine derivatives. Morphine, Codeine, Ethylmorphine, Dihydrocodeine, Oxycodone, Nalorphine, Azidomorphine, Apomorphine.
Synthetic narcotic analgesics. Morphinan derivatives: Levorphanol, Dextrometorphan. Benzomorphan derivatives: Phenazoine, Pentazocine. Phenylpiperidine derivatives: Pethidine, Alphaprodine, Betaprodine. Methadone derivatives: Methadone, Piritramide.
Endogenous opioid peptides.
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.
Pyrazolinone derivatives. Synthesis and analysis of pyrazoline derivatives. Phenazone, Aminophenazone, Novaminophenazone, Phenylbutazone, Oxyphenbutazone.
Anthranilic acid derivatives. Mefenamic Acid, Flufenamic Acid, Tolfenamic Acid, Niflуminic Acid.
Arylacetic acid and arylpropionic acid derivatives. Indomethacine, Diclofenac Sodium, Ibuprofen, Naproxen.
Other derivatives. Piroxicam. Proquazone, Chloroquine, Rimazolium Methylsulfate.

Anti-inflammatory steroids
Preparation and analysis of glucocorticoids, Structure-activity considerations, Prednisolone, Hydrocortisone, Mazipredone, Betamethasone, Beclomethasone.
Neuroleptics
Phenothiazine derivatives. Structure-activity considerations, Steric structure of phenothiazine derivatives, Synthesis of phenothiazine derivatives, Biotransformation of phenothiazine derivatives, Chlorpromazine, Triflupromazine, Promethazine, Levomepromazine, Trifluoperazine, Flufenazine, Metofenazate, Thioridazine, Chlorprotixene, Clozapine.
Butyrophenone derivatives. Haloperidol, Droperidol, Trifluperidol.
N-[4,4-bis(*p*-Fluorophenyl)butyl]piperidine derivatives. Fluspirilene, Pimozide.

Antidepressants
Structure-activity considerations, Synthesis of tricyclic antidepressants, Steric structure of tricyclic antidepressants, Biotransformation of tricyclic antidepressants.
Tricyclic antidepressants. Imipramine, Protriptylin, Trimipramine, Amitriptyline, Nortriptyline, Doxepine, Dibenzepine.
Monoamine oxidase inhibitor antidepressants. Phenelzine, Tranylcypromine, Pargyline, Clorgiline.
Second-generation antidepressants. Maprotiline, Amoxapin, Mianserin, Trazodone, Viloxazine, Fluoxetin.
Lithium salts. Lithium Carbonate.
Antiparkinsonism agents
Central anticholinergics. Procyclidine, Trihexyphenidyl, Tolperisone.
Antihistamines. Diethazine, Methixene.
Drugs which increase brain levels of dopamine. Levodopa, Selegiline, Benserazide, Bromocriptine, Amantadine.
Psychomotor stimulants and anoretics
Psychomotor stimulants. Amphetamine, Metamphetamine.
Anoretics. Phentermine, Chlorphentermine, Clortermine, Benzfetamine, Fenfluramine, Amfepramon, Methylphenidate, Phenmetrazine, Propylhexedrine, Mazindol.
Methylxanthines. Synthesis and analysis of methylxanthines, Caffeine, Theophylline, Theobromine.
Analeptics. Strychnine, Lobeline, Camphor, Pimeclone, Nikethamide, Pentetrazol, Picrotoxin, Etamivan, Doxapram.
Nootropics.
Glutaminic acid, Piracetam.
Anxiolytics
Propanediol carbamate anxiolytics. Meprobamate.
Benzodiazepines. Synthesis of benzodiazepines, Structure-activity considerations, Structure and steric structure of benzodiazepines, Biotransformation of benzodiazepines, Analysis of benzodiazepines. Diazepam, Nordazepam, Oxazepam, Chlordiazepoxide, Medazepam, Alprazolam, Tofizopam.
Other anxiolytics. Trimetozine, Benzoctamine.
Hallucinogens
LSD, Mescaline, Tetrahydrocannabinol.

Practicals

week 1

Seminar: Measures in the laboratory. Safety instructions and fire-protective rules. Lab note book.

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

Seminar: Pharmaceutical nomenclature. □uantitative assays. Group of halides. Compounds of halides, oxygen group and alkali hydroxids: Chlorine water, bromine, *Iodum*, *Acidum hydrochloridum*, *Natrii chloridum*, *Kalii chloridum*, *Natrii bromidum*, *Kalii bromidum*, *Natrii iodidum*, *Kalii iodidum*, chloride of lime, *Kalii perchloras*, *Aqua purificata*, *Aqua valde purificata*, *Aqua ad iniectabilia*, *Hydrogenii peroxidum 30 per centum*, *Natrii hydroxydum, Kalii hydroxidum.*

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 fuoridum 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*, *Natrii sulfas, Kalii sulfas*, *Natrii thiosulfas*, Nitrogenium, *Ammoniae solutio concentrata*, *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

Ammonii bromidum It. A, B, Pt. Appearance of solution, Acidity or alkalinity, Bromates, Iodides, Informative test: 2, 3

Seminar: Inorganic arsenic and bismuth compounds. Carbo and inorganic compounds of carbon. Silicium, lead, boron, aluminium and zinc compounds. *Arsenii trioxidum ad praeparationes homoeopathicae*, *Bismuthi subnitras ponderosus*, *Carbo activatus*, *Carbonei dioxidum*, *Natrii hydrogenocarbonas*, *Kalii hydrogenocarbonas*, *Natrii carbonas*, *Kalii carbonas*, *Lithii carbonas*, *Silica colloidalis anhydrica, Silica colloidalis hydrica, Aluminii magnesii silicas, Magnesii trisilicas*, *Talcum*, *Kaolinum ponderosum, Acidum boricum*, *B*orax, *Aluminii oxidum hydricum*, *Aluminii sulfas*, *Alumen*, *Aluminii chloridum*, *Zinci chloridum*, *Zinci oxidum*, *Zinci sulfas.*

week 6

Natrii hydrogenocarbonas It. A, B, C, Pt. Appearance of solution, Chlorides, Sulphates, Heavy metals, Iron, Ammonium, Arsenic

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*

chloridum, Mangani sulfas, Kalii permanganas, *Calcii chloridum*, *Calcii carbonas*, *Calcii hydroxidum*, *Calcii sulfas*, *Magnesii subcarbonas levis*, *Magnesii chloridum*, *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

Calcii sulfas dihydricus 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 nitras 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

Seminar: Nomenclature of organic drug compounds. Carbocyclic and heterocyclic skeletons, functional groups. Isomerism of the organic drug compounds. Constitution, configuration, conformation. Geometrical isomerism: *Z, E, cis, trans, endo, exo*. Chirality, optical isomerism. Enantiomers, epimers, diastereomers, inversion, retention. Indication of the configuration: Fischer and Cahn-Ingold- Prelog conventions. Absolute and relative configuration. *L, D, meso* and *erithro- threo* isomerism, *enol- oxo*, *lactam-lactim* tautomerism.

week 9

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

Arsenii trioxidum ad praeparationes homoeopathicae It. A, B

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

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

Calcii 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, Barbitalum, Phenobarbitalum (Sevenal), Hexobarbitalum (Novopan), 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 chloridum hexahydricum It. A, B, Pt. Free chlorine, 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 (Diphedan), etosuximid (Petnidan), clonazepam (Rivotril), carbamazepine (Stazepine, Tegretol), lamotrigin (Lamictal), valproic acid (Convulex)
Neuroleptics:, Chlorpromazini hydrochloricum (Hibernal), chlorprotixen (Truxal), Haloperidolum, Risperidonum (Risperdal), Clozapinum (Leponex), olanzapin (Zyprexa)
Anxiolytics: Chlordiazepoxidum (Librium), Diazepamum (Valium), medazepam (Rudotel), alprazolám (Xanax), tofizopam (Grandaxin), meprobamate (Andaxin), 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, Aethylmorphini hydrochloricum, Pethidini hydrochloricum (Dolargan), Methadoni hydrochloricum (Depridol), Nalorphinium bromatum
Antidepressants: Imipramini hydrochloricum (Melipramin), Amitriptylini hydrochloricum (Teperin), fluoxetine (Prozac), sertaline (Zoloft)
Antiparkinson agents: levodopa (Dopaflex), amantadine (Viregyt-K), Apomorphini hydrochloricum, selegiline (Jumex), procyclidine (Kemadrin)
Muscle relactants: Pipecuroni hydrobromidum (Arduan), Baclofenum (Lioresal), Carisoprodolum, Tolperisone (Mydeton)

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

Hydrargyri 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: cocain, 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, Marcain)
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. Physostigmine, Neostigmine, Pyridostigmine, Ecothiopate.

Irreversible AChE inhibitors. Paraoxon, Parathion, Methylparathion.
Cholinesterase reactivators.
Parasympatholytics
Tropane alkaloids, Structure of tropine and pseudotropine, Synthesis of tropane, Analysis of tropane alkaloids, Structure elucidation of tropine and pseudotropine, Atropine, Scopoéamine, Homatropine, Methylhomatropine, Tranteline, Propantheline, Cyclodrine.
Sympathomimetics
α-Sympathomimetics. Norepinephrine, Epinephrine, Oxedrine, Pholedrine.
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 spasmolytics.
Antianginal agents and vasodilators
Nitrates and nitrites. Amyl Nitrite, Nitroglycerine, Pentaerythritol Tetranitrate, Isosorbide Dinitrate, Nicotinic Acid, Xantinol Nicotinate, Nicotinamide.
β-Adrenergic blocking agents. Oxprenolol, Pindolol, Propranolol, Metoprolol, Atenolol.
Selective calcium antagonists. Verapamil, Nifedipine.

Cardiovascular drugs
Antiarrhythmic drugs
Steric structures of quinine and quinidine, □uinidine, Procainamide, Lidocaine.
Antihypertensive agents
Reserpine
Guanidine derivatives. Guanethidine, Guanazodine, Debrisoquin.
Drugs acting directly on smooth muscle. Diazoxide, Dihydralazine, Clonidine
Angiotensin-converting enzyme inhibitors, and adrenergic blockers. Captopril, Methyldopum, Pargyline.
Calcium channel blockers. Verapamil, Nifedipine, Nitrendipine, Prenylamine, 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, Ethophylline, Theobromine, Caffeine.
Mercurials. Mercamphamide, Mercurophylline.
Sulphonamides, Benzothiadiazines. Acetazolamide, Chlorothiazide, Hydrochlorothiazide.
High-ceiling diuretics. Furosemide, Etacrynic acid, Clopamide, Chlortalidone.
Endocrine antagonist. 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, Riboflavine, Niacinamide, Pantothenic Acid, Pyridoxine, Biotin, Folic Acid, Vitamin B_{12}.

Hormones
Pituary and hypothalamic hormones. Corticotropin, Lipotropin, Prolactin, Somatotropin, Follitropin, Lutropin, Thyrotropin.
Sex hormones and analogues
Androgens. Testosterone, Methyltestosterone.
Oestrogens. Oestrone, Oestradiol, Ethinyl oestradiol, Mestranol, Dienestrol, Diethylstilbestrol.
Antioestrogen. Clomifen.

Progestins. Progesterone, Norgestrel.
Oral contraceptives. Ethinyl oestradiol, Mestranol, Norgestrel, Levonorgestrel, Ethynodiol diacetate.
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, Oxytetracycline, Doxycycline.
Chloramphenicol

Amino acids, Proteins, Enzymes and Peptide Hormones

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

Proteins. Conformational features of protein structure, Purification and classification. Thrombin, Haemoglobin, Gelatin, Gelatin sponge, Cobra Venom Solution.

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

Measures in the laboratory. Safety instructions and fire-protective rules. Lab note book. Reception of laboratory equipment.

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)

Spasmolytics: 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 (Mydrum)

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 acetas 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:

Sympatholytics: Prazosine (Minipress), Propranolol (Huma-pronol), Atenolol (Blokium), Metoprolol (Betaloc), Pindolol (Visken)

Antiasthmatic drugs: Theophylline, Salbutamol (Buventol), Terbutaline (Bricanyl)

Antiarrhythmic drugs: □uinidine, 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

Ethanolum (Identification: C, D; Tests: Appearance, Acidity, alkalinity; Informative test: 2)

Alcohol isopropylicus (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: Methyldopum (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 (Blocalcin)

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)

Lidocaini 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 (Paxirasol), Ambroxol (Halixol), Terpin, Acetylcysteine (ACC, Fluimucil)

Drugs of osteoporosis prevention: Clodronic acid (Bonefos)

Drugs for gout: Allopurinol (Milurit)

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

Antidiabetics: 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)

Isoprenalini 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)

Phenylbutazonum (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 (Ulceran, Zantac), Omeprazole (Losec)

Diuretics: Acetazolamide (Huma-Zolamide), Furosemide (Furon), Hydrochlorothiazide (Hypothiazid), Etacrynic 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: Salicyclic acid, Acetylsalicylic acid (Aspirin), Paracetamol (Rubophen), Phenacetin, Aminophenazone, Propiphenazone, Metamizol sodium (Algopyrin)

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

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

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, B; Tests: Appearance of solution, Oxalic acid, Chloride, Sulphate, Calcium)

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

Bismuthi subgallas (Identification: A, B)

Seminar:

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

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

Antimalarial agents: □uinine, Chloroquine (Delagil), Mefloquine (Lariam), Pyrimethamine

Antiseptics and desinfectans: Chlorogenium, Methenamine

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

Chemotherapic silfonamides: Sulfacetamide, Sulfadimidine, Sulfamethoxazole, Sulfasalazine (Salazopyrin)

Chemotherapic nitrocompounds: Nitrofurantoin, Metronidazole (Klion)

Other chemotherapic compounds: Trimethoprim, 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_1), Ergocalciferol (vitamin D_2), Cholecalciferol (vitamin D_3), Menadione (vitamin K_3), Thiamine chloride (vitamin B_1), Riboflavine (vitamin B_2), Pyridoxine (vitamin B_6), 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 (Viramune)

Antibiotics: Benzylpenicillin, Ampicillin (Semicillin), Amoxicillin (Aktil), Oxacillin, Imipenem (Tienam), Sulbactam, Clavulanic acid, Cephalexin (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
- □uality 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

Emusions 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 metods

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 oinments, 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
Diluendum, 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.)
□uality 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);

Electronical (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: definiton, 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: definiton, 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: suspenions, definitions, classification, flocculation, industrial manufacturing methods, equipments, kinetics of sedimentation.

Semisolid dosage forms

Soaps and soap-containing preparations: definitons, 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 equpiments), types of moulds (metal, plastic), form-fill-seal.

PATHOPHYSIOLOGY

5th semester (15 weeks)

WEEK	LECTURE (2 hrs/week)	SEMINAR (2 hrs/week)	PRACTICE (2 hrs/week)
1.	Inflammation	Normal ECG. Review of physiologic background.	ECG leads.Registration of ECG.
2.	Congenital heart diseases	Inflammation	ECG leads.Registration of ECG
3.	Pathophysiology of valvular heart diseases. Adaptation of the heart, heart failure.	Congenital heart diseases	Analysis of ECG.
4.	Changes in plasma lipoproteins. Atherosclerosis	Pathophysiology of valvular heart diseases. Adaptation of the heart, heart failure.	ECG: Atrial and ventricular hypertrophy.
5.	Angina pectoris, myocardial infarction, sudden ischemic death	Changes in plasma lipoproteins. Atherosclerosis	ECG: atrial and ventricular preexcitation (ES)
6.	Hypertension, hypotension	Angina pectoris, myocardial infarction, sudden ischemic death	ECG: angina, myocardial infarction
7.	Syncope, shock	Hypertension, hypotension	ECG: atrial fibrillation, ventricular fibrillation and flattern
8.	Pathophysiology of salt-water balance I.	Syncope, shock	ECG: atrioventricular blocks (A-V)
9.	**AUTUMN BREAK**		
10.	Pathophysiology of salt-water balance II.	Pathophysiology of salt-water balance I.	ECG: Left and right bundle branch (Tawara) block
11.	Pathophysiology of kidney diseases I.	Pathophysiology of salt-water balance II.	ECG: Electrolyte abnormalities and ECG
12.	Pathophysiology of kidney diseases II.	Pathophysiology of kidney diseases I.	Investigation of urine smaples and renal function
13.	Obstructive pulmonary diseases. Hypoxias	Pathophysiology of kidney diseases II.	Investigation of urine sampels and renal function
14.	Restrictive pulmonary diseases	Obstructive pulmonary diseases. Hypoxias	ECG: WPW Determination of Spirometric parameters.
15.	Disturbances of acid-base metabolism. Metabolic acidosis and alkalosis.	Restrictive pulmonary diseases. Respiratory acidosis, alkalosis	ECG: repetition, summary and review

6th semester (15 weeks)

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

Immunology

5th semester (15 weeks)

WEEK	LECTURE **(2 hrs/week)**
1.	Basic principles of immunology. Constituents of the immune system. Primary and secondary immune organs. Antigens.
2.	Ontogeny of B-cells. Antigen recognition by and activation of B cells.
3.	Ontogeny of T-cells. Antigen recognition by T cells. Classification of T cells.
4.	Major features of innate immunity. Phagocytosis. Complement system.
5.	Humoral immune response. Structure of immunoglobulins, heterogeneity and genetics.
6.	The histocompatibility complex (MHC). Structure of the molecules and functional heterogeneity. Genetic organization. Antigen presentation by MHC.
7.	Major elements of immune regulation. Signal transduction systems. Adhesion molecules. Cytokines.
8.	**AUTUMN BREAK**
9.	Mechanisms of immunotolerance. Immunology of transplantation. Autoimmunity.
10.	Immunization against microbes. Vaccination
11.	Immunopathology. Hypersensitivity reaction. Immunodeficiencies.
12.	Manufacture of immunological products and their quality control.
13.	Immune response to infectious agents.
14.	Immunological methods.
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	Introduction, laboratory safety. Wet-mount preparation. Preparation of bacterial smear. Simple staining.
2.	Principles and practice of sterilization and disinfection. Factory hygiene and good manufacturing practice. Microbiological requirements and purity classes of pharmaceutical products.	Combined staining. Practice of sterilization. Sterility testing. Disinfection.
3.	Pharmaceutical products of microbial origin. Microorganisms in pharmaceutical industry. Microbial genetics.	Culture media. Inoculation and plating bacterial culture. Haemoculture, anaerobic cultivation.
4.	Antibiotics and antimicrobial agents. Mechanisms of action of antibiotics. Bacterial resistance to antibiotics. Antibiotic policy . Industrial production of antibiotics.	Colony morphology. Biochemical tests.
5.	Production of pharmaceuticals by recombinant DNA technology Pathogen-host interactions Pathogenesis of bacterial infection	Test of bacterial resistance to antibiotics. Enumeration of bacteria.
6.	Streptococcus, Neisseria, Enterococcus, Staphylococcus	Sterility and pyrogenicity testing of pharmaceutical products
7.	Gram positive anaerob rods (Clostridium) and B. anthracis Gram positive aerob rods (Corynebacterium, Listeria,) Spirochaeta, Mycobacterium.	MTO
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 I.: Precipitation, agglutination.
10.	General properties and structure of viruses. Reproduction of viruses. Viral pathogenesis, chemotherapy of viral infections. Obligate intracellular bacteria (Chlamydia, Coxiella bunettii, R. slovaca, R. prowazekii).	Serological tests II.: CFT; IF; RIA, etc. Cell mediated reactions.Serobacteriological products. Vaccines.
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 bacteria I.
12.	Hepatitis viruses. RNA viruses I. Influenzaviruses, measles-, mumps-, rubeola viruses.	Summary of the most important human pathogenic bacteria II.
13.	RNA viruses II.Retroviridae, AIDS.RNA viruses IIIPoliovirus, coxsackie viruses. Rabiesvirus.	Propagation and assay of viruses.Serological methods in virology.
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.	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

Excretion of drugs by kidney, liver, lung and other mechanisms (sweat, saliva, milk). Biotransformation of substances. Drug sensitivity of newborns and aged persons. Genetic factors in biotransformation. Pharmacogenetics and drug allergy. Storage of drugs in the body.

The kinetics of drug elimination. Zero order elimination: the kinetics of alcohol consumption and elimination. First order elimination: elimination half-life, elimination rate constant and determination of them. The clearance value: total, renal and hepatic clearance. Cumulative urinary excretion.

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).

Intravascular drug administration. Zero order absorption and first order elimination: pharmacokinetics of drug infusion. Plateau principle. Time course of plateau. Drug concentration elicited by drug infusion. Loading dose and maintenance dose. Kinetics of drug cumulation.

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

Single dose administration. Description of one compartment open model. Time course of drug concentration after intravascular and extravascular drug administration. Linear and non-linear pharmacokinetics. Two compartment open model. Time course of drug concentration after intravascular and extravascular drug administration. The shape of blood level curves.The AUC value and the methods for calculation of it.

Principles of multiple dose administration. Elimination, maintenance and cumulation factor.

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

Applied biopharmaceutics

General concept and determination of bioavailability. Calculation of absolute and relative bioavailability. Biological and technological factors influencing the bioavailability. Dissolution constant and its influence on the shape of blood level curve. Pharmaceutical, biological and therapeutical equivalence of drug preparations.

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.

SYLLABUSES FOR 4TH YEAR PHARMACY STUDENTS

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: voltametry, polarography, amperometry, potentiometry, conductometry and oscillometry.
- Spectrophotometry, spectrophotometers, atomic and molecularspectra, 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 atomicabsorption 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 DTG. DTA, DSC).
- Optical rotation (ORD, CD), refraction and molecular refraction.
- X-ray diffraction (XRD), XRD analysis of solid pharmaceuticals and determination of particle size.
- Fundamentals of nuclear pharmacy. Radionuclide generators (liquid and solid column). Dosage forms of radiopharmaceuticals. Radioimmunoassay (RIA).

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, paperchromatography, 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.
Chemical purity and its control. The origin of impurities. Manufacturing product licensing standards. Pharmacopoeial standards. Identity, purity and assays of pharmaceuticals according to pharmacopoeias.
Methods of drug registration, preclinical requirements, clinical trials (phases I-III), quality control during manufacturing (GMP) and quality control in post-marketing phase.
□uality control and separation of formulated pharmaceuticals. Separation of active ingredient/s from the base and separation of active components into fractions. Separation of formulated pharmaceuticals according to Stass-Otto. Identification of separated components. General tests: sensory, heating test, solubility and acidity/alkalinity. Chemical examination: tests for elements (sulphur, halogen, nitrogen, etc.). Assay of halogens and sulphur according to Carius and Schoeniger. Analysis of pharmaceuticals on the basis of functional groups. Hydrocarbons (saturated, unsaturated and aromatic). □ualitative and quantitative determination of halogenated hydrocarbons. Compound with one or more hydroxy groups (alcohols and phenols). Ethers, aldehydes and ketones. Reactions of amines and alkaloids, their determination in galenicals and formulated dosage forms. Carboxylic acids and their derivatives. Their determination in galenical preparations and in vegetable drugs. Urea derivatives (ureides) and sulphonamides and their reactions. Amino acids and peptides, their synthesis and reactions. □uality control of peptide derivatives.

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: noraminophenazone sodium mesilate
Assay: noraminophanazonum natrium mesilicum
Solution theobromoiodati (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

Acidi- 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.
Titrations in non-aqueous solvents: titration of alkali metal salts of organic acids and the titration of halogen acid salts of organic bases (alkaloids).
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
Collodium cum acido salicylico Fo No VII. dos. I (10,0 g)
Gutta analeptica FoNo VI. dos. ½ (10,0 g).
Otogutta chloramphenicoli 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)
Suspensio bismuthi subsalicylici pro infante FoNo VI. dos. I. (100,0 g)
Suspensio expectorans FoNo VII. dos ½ (100,0 g)
Emulsio olei jecoris 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)
Suspensio anaesthetica FoNo VII. dos. I (100,0 g) ½ cs
Suspensio salicylamidi 2% cum sorbito FoNo VI. dos. I (100,0 g)
Suspensio 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 (50,0 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 antipyreticum 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)

Oralytpulver 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 chloramphenicoli*
- *Oculogutta erythromycini*
- *Oculogutta gentamicini*
- *Oculogutta homatropini*
- *Oculogutta indosoli*
- *Oculogutta naphazolini*
- *Oculogutta neomycini*
- *Oculogutta neonatorum*
- *Oculogutta pilocarpini*
- *Oculogutta polymyxini*
- *Oculogutta rifampicini*
- *Oculogutta scopolamini*
- *Oculgutta tetracaini*
- *Oculogutta viscosa*
- *Oculogutta zinci*

Eye ointments
Bases of eye ointments
- *Oculentum simplex*
- *Oculentum hydrosum*
- *Oculentum basis*

FoNo preparations
- *Oculentum dionini*
- *Oculentum erythromycini*
- *Oculentum neomycini*
- *Oculentum neomycini 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 requiremets
- 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 absoption modifiers

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

Therapeutic systems I
- Solid systems
- Biodegradabile polymers

Therapeutic systems II
- Semisolid systems
- TTS
- Lyotropic liquid crystals
- Micro- and multiple emulsions
- Microsferes, 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 kalii chlorati (FoNo VII., 100 g)
Repetation of solid dosage forms
Sparsorium antimycoticum (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 pernionem (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 Vet. 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 Pharmaceuticum 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 differen 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 film forming temperature with different film forming polymer compositions.
Film coating of granules in centrifugal granulator.
Film coating of granules in fluid granulator with the use of Wurster-column.
Film coating of tablets.
Sugar coating of tablets in drageé pan.
Dissolution test of enteric coated tablets.
Investigation of diffusion.
Designing, preparing and investigating of new tablet composition.

Investigation of dosage forms

Investigation of suspensions:
- distributional stability investigations of flocculated and non-flocculated suspensions
- deteremination 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 sols'viscosity changing:
- study the viscosity changing by electrolites of the Mucilago methylcellulosi and Mucilago hydroxyaethylcellulosi.

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 determinating 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:
- Investigation of the water-absorption process by means of Enslin-apparatus.

Light permeability determination of glass containers:
- Investigation of transmittancy of glass containers with different colours in a given wave lenght 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 periferal 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 microbal 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. Enternal and parenteral route of administration.

Dose-response relationship of drugs. Indication of microsomal enzymes by phenobarbital. Statistical evaluation of experimental data. Drug interactions, competitive antagonism. Experiments in isolated guinea pig ileum. Dose-response relations. General anaesthesia. Demonstration of anaesthesia induced by ethylether. Intravenous anaesthetics. Narcotic analgesics. Methods for demonstration of analgesic activity. Evaluation of analgesic potency.

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 automic 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 anaethetized rabbit.

Drugs acting on blood coagulation. Evaluation of prothrombin activity. Anticoagulant activity of heparin and acenocoumarol.

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.

Toxicological invesitgations. Benefit of activated charcoal. Demonstration of leucopenia produced by cytotoxic agent. Determination of cholinesterase activity after intoxication with organophosphate substances.

Public Health

7th semester (15 weeks)

WEEK	LECTURE **(2 hrs/week)**
1.	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
4.	Epidemiology of enteric diseases, toxicoinfections
5.	Epidemiology of cutaneous and sexually transmitted diseases
6.	Epidemiology of haematogenic diseases and zoonoses
7.	Prion diseases. Prevention of nosocomial diseases
8.	**HOLIDAY**
9.	**AUTUMN BREAK**
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)

WEEK	LECTURE (2 hrs/week)
1.	Epidemiology of smoking, alcohol and drug consumption
2.	Basics of nutritional hygiene. Diseases caused by deficiency in proteins, carbohydrates, lipids, vitamins and minerals. Toxic substances in foodstuffs - natural and man-made. Prevention of nutrition related diseases
3.	Influencing the health status of high risk populations (mother, infant, youth. elderly)
4.	Environmental hygiene: the ecological and health effects of air pollution
5.	Environmental hygiene: the ecological and health effects of water pollution, sewage disposal
6.	Environmental hygiene: the ecological and health effects of soil pollution and waste incl. hazardous waste disposal.
7.	Hygiene of settlements and dwellings. Urbanization
8.	**SPRING BREAK**
9.	Environmental and occupational hygienic requirements in establishing and operating public and hospital pharmacies
10.	General occupational health and ergonomy. Health effects of excesses of temperature
11.	Health effects of excesses of pressure, noise and vibration.
12.	Health effects of ionizing and non-ionizing radiation. Pneumoconiosis
13.	Basic toxicology. Toxicology of heavy metals and solvents
14.	Toxicology of gases, plastics, PAH, dioxins, etc.
15.	Toxicology of agrochemicals. Risk assessment, management and communication

ETHICS IN PHARMACY

Basic definition
Human rights in pharmaceutical practice
The calling of pharmacists
Development of medical and pharmaceutical ethics
Hungarian universities and academies
Ayurveda. Hindu medical ethics. Buddhism.
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.
Code of ethics (APhA). Solidarity 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
Self-mutilation. Donation of blood. Artificial insemination.
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

SYLLABUSES FOR 5TH YEAR PHARMACY STUDENTS

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" endomymetritis, 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
Applied drug technology as a paret of clinical pharmacy. Formulation of oral preparations. Liquid oral drug formulations. Formulation of parenteral drugs, formulation of intramuscular, intravenous injections. Parenteral therapeutic systems. Rectal drug formulations, local drug formulations.
Non-compliance
Idea, definition, extent and importance of non-compliance. Methods for assessment of non-compliance. Major reasons for non-compliance. Strategies for improving compliance.
Therapeutic drug monitoring
Possibilities in public pharmacy practice. Hospital practice (Drug history taking. Monitoring of drug effectiveness. Drug blood-level monitoring. Measurement methods).
Drug side-effects
Drug side-effects. Classification, reasons of drug side-effects. Drug side-effect monitoring systems.
Drug interactions
Influental 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
General anaesthetics. Local anaesthetics. Hypnotics and sedatives. Analgesics. Antitussive agents. Antiepileptics. Drugs for Parkinson's disease. Central nervous system stimulants. Drugs for psychiatric disorders, psychostimulants and anorectic medicines.
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 blood formation. Anticoagulants. Hemostatics. Correction of plasma and blood volume.
Drugs influencing the function of the GI tract
Drugs of nutrient character. Flavoring agents. Stomachics. Drugs influencing bile secretion. Emetics and antiemetics. Laxatives and purgatives. Antidiarrheal drugs.
Drugs influencing the hepatic function
Mineral substances influencing the metabolism
Vitamins and hypovitaminoses
Pharmacology of hormones. Biotechnics.
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 /Eryhromycin, Tylosin, Oleandomycin, Spiramycin, Kitasamycin/
Other antibiotics /Lincomycin, Tiamulin, Virginiamycin, Novobiocin, Rifamycins, Fumagillin, Vancomyscin, Fusidic acid./
3rd group: Other antibacterial pharmacons
Nitrofuran derivatives /Furazolidone, Nitrofurantoin./
□uinoline derivatives /Halogenated quinolines, □uinolonic acid derivatives, Nalidixic acid, Oxolinic acid, Flumequine, Enrofloxacin./
4th group: Combinations of antibiotics and chemotherapeutics
Antimycotics. Drugs for treatment of surface mycosis. Pharmacons used for the treatment of systemic mycoses.
Antiviral agents
Antitumorous pharmacons
Antiprotozoal medicines. Medicines against trypanosomes. Medicines of trichomonosis and histomonosis. Medicines of babesiosis. Therapy of plasmodiosis (malaria). Medicines of coccidiosis. Ionophoric antibiotics.
Anthelminthics. Antitrematodes. Anticestodes. Antinematodes.

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 solemny/ 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.