Al-Farabi Kazakh National University
Syllabus
(5B71000* Organic Chemical Technology
The spring semester of the academic year 2016-2017

Discipline code	Discipline title	Type	Hours in a week			Credit	ECTS
			Lecture	Seminar	Lab		
ChTTOS 5307	chemistry and technology of fine organic synthesis		15	15		3	5
Prerequisites	Organic Chemistry of aliphatic compounds, cyclic compounds in organic chemistry, chemical engineering, chemistry, organic synthesis and technology, organic chemical technology, bioorganic chemistry and etc.						
Lecturer	Bazhykova Kulzada Begalinovna C.Sc, associated professor				**Classroom hours**	According to the schedule	
e-mail	bazhikova@bk.ru						
Telephone	87772943867				**room**	525, 516	
Academic presentation of a course	Fine chemicals Industrial multi-stage low-tonnage production of organic substances. fine organic synthesis products: pharmaceuticals, pesticides and other substances for chemicals used in agriculture, dyes, textile auxiliaries and fragrances, chemicals, additives for polymeric materials, chemicals for film photographic materials, chemical reagents, and others. This of course fine organic synthesis products, particularly important compounds will be used and the construction of roads and properties.						
Aim of course:	Gentle knowledge of chemistry and technology of fine organic synthesis. To give knowledge about the basic methods of industrial production of basic and fine chemicals.						
Problems of the discipline:	- Formation of knowledge about modern methods of obtaining the most important synthetic products of the chemical nature of the impact of raw materials on the implementation of the industrial production method; - Formation of knowledge about the production of intermediates for dyes, medicines, and other fragrant substances. - The acquisition of the most important concepts of fine chemicals; - The acquisition of notions about the main trends of development of the modern chemical industry in Kazakhstan and abroad.						
Learning outcomes	**Master students have to know:** To know the industrial technology of thin organic synthesis; methods of preparing the most important synthetic products; value and their role in organic synthesis and methods for their preparation; intermediates for the manufacture of dyes, pharmaceuticals, aromatic substances, etc.; Excipients fine chemicals in various industries. - **Master students to be able:** - Be able to use this knowledge to solve specific problems; acquire new knowledge, using modern information technologies; in the conditions of modern chemical science and constantly changing social practice alone to reassess the lessons learned, an analysis of its features, the principles of construction of own working hypotheses. Have an understanding of the present level of organic synthesis processes;						

	a variety of practical applications of organic synthesis; of the basic processes of industrial technology of thin organic synthesis **Knowledge:** the current state, issue and prospects of development of thin organic synthesis and allied industries; fundamental bases of novel production methods of organic compounds, and the main principles of technological processes. **Comprehension:** to show a comprehension of the basic chemical processes of thin organic synthesis, relationship of physical and chemical properties, reactivity of organic compounds with technology of their chemical transfomations; **Application:** ability to apply the gained knowledge in self-contained optimization of synthesis and technological scheem of organic compounds production. **Analysis:** ability to analyze and systematize knowledge of physical and chemical bases and technology of industrial production of thin organic synthesis compounds; determination of regularities of isomerization, hydrogenation, dehydrogeneration, sulphonation, sulphating, nitration, esterification, hydrolysis, hydration, dehydration, alkylation, condensation, oxidation, halogenation processes. **Synthesis:** to be able to optimize conditions and methods of synthesis of products of fine organic synthesis considering profitability and environmental sustainability of processes; to develop methodologies of targeted synthesis of organic compounds considering features of their structure and properties. **Assessment:** to be able to estimate effectiveness of the developed methods and technologies products of fine organic synthesis obtaining; to choose the most rational ways of increasing in their efficiency.
Literature and resources	**basic** 1. Tedder J., Lacking A., A. Jubb Industrial Organic Chemistry. Translated from English. ed. OV Korsun. -Moscow: Mir, 1977. -700 p. 2. Lebedev NN Chemistry and Technology of basic organic and petrochemical synthesis.-M.:Chemistry,1975.-733p. 3. Yukelson II Technology of basic organic synthesis. - M .: Chemistry, 1968. - 848 p. **Additional:** 4. Paushkin YM, Adelson SV, TP Vishnjakova Petrochemical Synthesis Technology. - M .: Chemistry, 1975. -352 p. 5. Dalin MA Kolchin IK, BR Serebryakov Acrylonitrile. - Baku .: Publishing. Azerbayd Academy of Sciences, 1968. -226. 6. Caprolactam / Ed. VI Ovchinnikov and Ruchinski VR - M .:Chemistry, 1977. - 263 p. 7. Passetto BV The technology of chemical-pharmaceuticals and antibiotics. - M .: Medicine, 1977. - 430 p. 8. Safronov TS Ways of development of the chemistry of drugs. - M .: Knowledge, 1978. - 16 p. 9. Vorontsov II Production of organic dyes.- M .: Chemistry, 1962. -554 p. 10. Gurvich JA, Kumok ST Chemistry and Technology of intermediates and organic dyes. - M .: Vyssh.shk., 1967. -50p. 11. Kasparov GN Fundamentals of manufacturing of perfumes and cosmetics. - M .: Food industry, 1978. 256. 12. Bratus IN Chemistry odoriferous substances. -M.: Food industry, 1979. -301.

	13. The technology of natural essential oils and synthetic fragrances. - M .: Light and food prom, 1984. -.368. 14. Schoenfeld N. surfactants based on ethylene oxide. - M .: Chemistry, 1982. - 750 p. 15. Melnikov NN Chemicals and pesticides technology. - M .: Chemistry, 1974. - 240s.
Academic policy of a course	For assessment of extent of assimilation of the gained knowledge semi-semestrial examination (Midterm) and colloquiums are carried out. Preparation of IWMT and SWM in the form of presentations, and different types of homework are carried out during semester. The colloquium is given during seminar lessons, Midterm is given in special time according to the schedule. **Requirements to a course:** 1. Students are obliged to attend classes and not to be late for lessons. It is necessary to have the medical certificate or a "Certificate proving hospital visit" in case of absence on classes in the reason of an illness. These documents include the period of hospitalization or treatment and the reason for his/her class absence. In the event that master student is unable to attend classes due to unavoidable circumstances such as illness or the death of a family member, need to inform teacher of his absence from classes. 2. Students have to prepare all types of homework according to the provided discipline schedule. It is not allowed to prepare homework at the lesson during its carrying out. 3. Only questions concerning a subject of a lesson are discussed during the classroom occupation. 4. All types of work need to be carried out in the specified terms. Works are not accepted to or after the expiration of terms of their acceptance. 5. It is necessary to use the basic and additional literature for homework preparation. 6. Checking of SWM by teacher is carried out during the seminar lessons. 7. Consultations about SWM and IWMT preparation and additional information on the studied material, exam and other questions will be given by teacher in the period of his classroom hours. 8. The active and productive participation of master students in educational process, self-contained preparation of home work, SWM and other types of work are encouraged. 9. It is not allowed to read other literature and to use mobile phones during the lesson. 10. The students who did not hand over the next task or got less than 50% of points for its realization have an opportunity to fulfill the specified task according to the additional schedule. 11. The students who missed seminar lessons due to good reason, need to fulfill these lessons after admission of teacher in an extra time. 12. Master students, who did not carry out all types of work, are not allowed to exam. Master students activity and lessons attendance are evaluated. 13. Plagiarism and other forms of dishonest activity are unacceptable. Writing off during pass the SWM and exam, copying of tasks by other persons, passing an exam instead of other master students are inadmissible. Master student, convicted of falsification of any

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<tr><td></td><td>information, unauthorized access to the Internet, using cribs will be evaluated "F".
14. Tolerance and respecting of other person’s opinion are requested. Correct formulation of objections is also needed.</td></tr>
<tr><td>Assessment and certification policy</td><td>SWM and IWMT estimation:
1. SWM and IWMT will be distributed during all semester. SWM and IWMT tasks of discipline make 60% of total assessment of a course.
2. SWM and IWMT passed for a week later will be accepted, but assessment is lowered by 50%.
3. SWM and IWMT subjects will be included into examination questions.
4. It is necessary to perform 15 SWM during 1-15 weeks (4 points for each SWM).
5. Seminar lessons, SWM will be self-contained and creative.
Estimation of competences formation:
1. Midterm exam questions will be made according to lecture, SWM and IWMT task (three questions in the exam cards).
2. Colloquium is carried out on 7 and 15 weeks of a semester. It will make 20% of total assessment of a course.
3. The final exam is held upon completion of a course (three questions in the exam cards). Consulting classes will be given.
<table>
<tr><th>Description of self-study work</th><th>Percentage</th><th>Learning outcomes</th></tr>
<tr><td>1. Homework (preparation of seminar tasks);
2. SWM (preparation of oral reports);
3. IWMT (preparation of presentations, papers).
4. Colloquium 1
5. Colloquium 2
6. Midterm exam (passing of semi-semestrial examination).
1. Examination
2. Total</td><td>42 %
37 %
21 %
30 %
30 %
10 %

30 %
100 %</td><td>1,2,3,4,5,6
1,2,3,4,5,6
1,2,3,4,5,6
1,2,3,4,5,6

1,2,3,4,5,6
1,2,3,4,5,6,
1,2,3,4,5,6
1,2,3,4,5,6</td></tr>
</table>
Total assessment will be calculated by a formula:
{(Colloquium 1+ Colloquium 2) / 2}·{0,6 + 0,1MT + 0,3Total}
Minimum estimates as a percentage are given below:
95% - 100%: A 90% - 94%: A-
85% - 89%: B+ 80% - 84%: B 75% - 79%: B-
70% - 74%: C+ 65% - 69%: C 60% - 64%: C-
55% - 59%: D+ 50% - 54%: D- 0% - 49%: F</td></tr>
</table>

Schedule of discipline			
Week	**Subject title**	**Hour**	**Point**
1	**Lecture.** Characteristics of fine organic synthesis technology. The subject of the form of fine organic synthesis	1	
	Seminar. Criteria for the construction process. Evaluation industrial organic synthesis methods.	2	5
	SWM 1. Equipment domestic factories of thin organic synthesis. The		4

	main raw material in the fine chemicals industry.		
2-3	**Lecture.** The main reactions and methods of synthesis of fine chemicals.	1	
	Seminar. Intermediates for the synthesis of fine chemicals	2	10
	SWM 2-3 Wood raw material for organic synthesis and processing technology.		8
4	**Lecture.** Synthetic intermediates as the main raw material in the TOC. Modern processes of industrial synthesis chemistry aniline.	1	
	Seminar. Methods for cleaning aniline. Toluilendiaminy- most important products in the synthesis of synthetic dyes, drugs, herbicides	2	5
	SWM 4. The main method of industrial production of toluene diamine. Modern processes of hydrogenation reaction medium. Cleaning toluenediamine		4
5	**Lecture.** Synthetic organic dyes. Chemical classification of organic dyes, basic representatives, methods for their preparation. dyeing methods. organic dyes to modern requirements.	1	
	Seminar. The synthesis of alizarin blue dye (nitration, recovery, quinoline condensation bisulfitirovanie). Terms of the quinoline condensation - the responsible step of preparing a dye. Dye purification steps (alizarin blue).	2	5
	SWM 5. Production technology of the pigment from orange ß-naphthol.		4
6	**Lecture.** Anthraquinone dyes. Hydroxyanthraquinone dye - alizarin. Industrial technology.	1	
	Seminar. Phthalocyanine pigments. Main application: lacquers, enamels, coloring rubber, linoleum, production of pencils, art paints, etc. The main raw material.	2	5
	SWM 6. The technology of blue phthalocyanine pigment: baking, melt the selection of cleaning.		4
7	**Lecture.** Raw materials for the chemical-pharmaceutical industry. The basic chemical reaction based drug synthesis.	1	
	Seminar. Promising the creation of new medicines. Feature production associated with high specific consumption of raw materials and a fast update range of medicines.	2	5
	SWM 7. Evolution of Organic Chemistry of drugs. Modern requirements to drugs. Strategy of development of new synthetic drugs. Communication "structure - biological activity." The concept of developing a new drug.		4
	IWMT		**17**
	Colloquium		**20**
	IC		**100 (30)**
8*	**Midterm exam**		**100 (10)**
Modul 2.			

8	**Lecture.** The technology of phenacetin. Raw. The synthesis conditions.	1	
	Seminar. Synthetic domestic products, and products and manufacturing technology	2	5
	SWM 8. Herbal medicines and their production technology		3
9	**Lecture.** Chemistry and technology of aromatic substances	1	
	Seminar. Technological scheme of the terpineol: catalysts, the main stage, the preparation of intermediates to the technological operations.	2	5
	SWM 9. Production of aromatic substances.		3
10	**Lecture.** Aromatic alcohols: fenilkarbinol, β-phenyl ethyl alcohol in the production of odoriferous substances	1	
	Seminar. Ethers and acyclic terpene alcohols: diphenyl (geranium odor), carboxylic acid esters (flowers scent)	2	5
	SWM 10. the use of odoriferous substances in the compositions as perfume fixatives smell		**3**
11	**Lecture.** Chemistry and technology of plant protection products	1	
	Seminar. Chemical plant protection products. Classification of chemical plant protection products according to the method of use (bactericides, herbicides, intektitsidy, fungicides, antiseptics).	2	5
	SWM 11. Requirements for Pesticides. Basic requirements for the raw material base. The form of the use of drugs.		3
12	**Lecture.** Chemistry and technology of production of pesticides	1	
	Seminar. Nitro compounds and applications (insecticides, fungicides, bactericides, herbicides). The soil fungicide - brassizan.	2	5
	SWM 12. Quaternary ammonium salts as pesticides. Alcohols and phenols with insecticidal action as herbicides		3
13	**Lecture.** Herbicides. Fungicides. Production hexachlorocyclohexane new alpha, beta, gamma isomers	1	
	Seminar. Insecticides. Organochlorine insecticides.	2	5
	SWM 13. Domestic production of plant protection products		3
14	**Lecture.** Artificial and synthetic food.	1	
	Seminar. Microbial protein. Food and feed additives, their classification and synthesis. Requirements for Food Additives	2	5
	SWM 14. technology for producing synthetic food additives		3
15	**Lecture.** Chemistry and Technology of production of biologically active additives	1	
	Seminar. Preparation and production of vitamins	2	5
	SWM 15. Enzymes and their methods of preparation		3
	IWMT		**16**
	Colloquium		**20**
	IC		**100 (30)**

	Exam		**100 (30)**
	Total		**400 100)**

Chairman of methodical bureau,
candidate of chemical sciences R.K.Rakhmetullayeva

Chair of department of chemistry
and technology of organic matters,
natural compounds and polymers,
D.Sc, professor G.A. Mun

Lecturer,
C.Sc, associated professor K.B. Bazhykova

2.5. Искусственная и синтетическая пища.

Органическая химия и пищевая промышленность. Микробиологический белок. Пищевые и кормовые добавки, их классификация и синтез. Требования к пищевым добавкам