AL-FARABI KAZAKH NATIONAL UNIVERSITY

Faculty of Chemistry and Chemical Technology

Department of chemistry and technology of organic substances, natural compounds and polymers

Syllabus

Fundamentals of industrial organic chemistry
Module code - The basic compulsory module 10
Speciality Code-"5B072100-Chemical technology of organic substances"
Education Form - **Full time, 3 course**

Information about lecture: Dr. Bates Kudaibergenova Malikovna – PhD

Dr.Bates Kudaibergenova Malikovna working with natural polymer composite. According to results have been published 40 publication and 3 patents.

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Prerekvisits: "Organic chemistry", "Chemistry of aliphatic compounds"

The aim of course – Study of Fundamentals of industrial organic chemistry and to give more knowledge about organic science. This course introduces the basic principles and instrumentation of separation methods in chemistry. The major separation method used in chemical analysis, including chromatography and electrophoresis will be discussed. Characterization, mechanism involved in separation, instrumental systems, advantages and limitation of methods will also be discussed. Students will be exposed to development and application of knowledge in explaining the concepts and principles of separation. The development of key skills is facilitated by a program of tutorials and practices. Also this course deals with the four major instrumental methods such as ultra-violet/visible, infrared, mass spectroscopy and nuclear magnetic resonance spectroscopy. It provides a concise introduction to the physical background of each, describing how molecules interact with electromagnetic radiation or how they fragment when excited sufficiently, and how this information may be applied to the determination of chemical structures of organic compounds. It also includes simple descriptions of instrumentation and emphasizes modern methodologies such as the Fourier transform approach to data analysis.

Interaction task – systematical approach of methods of analysis of organic substances.

Knowledge and ability after passing of course: The future specialists in study of this course have to know about introduction of organic chemistry. And they have to be able study of organic compound by the physical-chemical methods.

The student has to know:

- Main methods of synthesis of organic compounds;
- The main methods of the chemical analysis of organic substances on functional groups;

The student has to be able:

- Account for the chemistry of the basic building block chemicals derived from fossile sources
- Describe economic and environmental issues associated with chemicals from fossile sources
- Account for important historic developments as well as future perspectives of industrial organic chemistry

▪ Discuss issues related to synthesis, degradation and environmental impact of industrial polymers

▪ Describe the use of catalysis, including biocatalysis, in the large scale synthesis of organic compounds

Characteristic of course: The course deals with the foundations of organic chemistry from an industrial perspective: Where do all the molecules which surround us in daily life come from, what aspects are involved in their production, and what are the current trends in the organic chemical industry? A brief historical overview is followed by more detailed discussions of important large scale processes, including chemical, economic, safety and environmental issues. Guest lecturers from chemical industries will illustrate the differences to small scale chemistry in a research lab, and provide real world examples. –

Schedule of lectures

Week	Schedule of lectures	Number of hours
1.	LECTURE 1 CLASSIFICATION industrial production of basic organic synthesis and Petrochemicals	1
2.	Lecture number 2 RAW MATERIALS FOR COMPANIES AND PETROCHEMICAL basic organic synthesis (hydrocarbon feedstock, COKE, vegetable and animal raw materials) and REQUIREMENTS E HIM	1
3.	Lecture number 3 INDUSTRIAL PRODUCTION METHODS acid, halogen, nitrogen-and sulfur-containing compounds based on products of primary and secondary processing oil and gas.	1
4.	LECTURE 4 Flow sheet of production of alcohol, epoxides, aldehydes, ketones.	1
5.	LECTURE 5 Flow sheet of production of alcohol, epoxides, aldehydes, ketones.	1
6.	LECTURE 6 Technological scheme of chloroform, carbon tetrachloride, dichloroethane, chlorobenzene	1
7.	LECTURE 7 Production scheme PERHLORALKANOV, perfluoroalkanes mercaptans, sulfonic	1
8.	LECTURE 8 Technological scheme of amino, nitro compounds, NITRILES	1
9.	LECTURE 9 Technological scheme of acrylonitrile and other acrylic monomers	1
10.	LECTURE 10 SUBJECT CLASSIFICATION AND DYE	1
11.	LECTURE 11 Synthetic detergents	1
12.	LECTURE 12 Nonionic detergents	1

13.	LECTURE 13 INDUSTRIAL APPLICATION OF OXYGEN-, halogen-, nitrogen-, and sulfur-containing organic compounds.	1
14.	LECTURE 14 Industrial methods for the production of monomers based on products of primary and secondary processing OIL AND COKE.	1
15.	LECTURE 15 TYPES OF SOLID FUELS. CLASSIFICATION OF COAL. coking	1

Self work of students

1 Explain the basic chemical resources and their application in chemical industry as well as other relevant industries.

2 Describe the basic process technology and technological economics fundamental to the industries.

3 Identify key pollution prevention strategies for the industries.

4 Discuss the major regulations impacting the industries.

5 Apply concepts in electromagnetic radiation interaction in organic chemistry

6 Explain organic functional groups determination with the aid of spectroscopy instrumentation .

7 Show understanding in spectroscopy knowledge in written and verbal form

8 Discuss spectrocopy knowledge with the updated technology and references.

9 Explain the basic concept of spectroscopic analysis in determining the chemical structure of organic molecules.

10 Show the appropriate analytical method in conducting the respective experiments and interpret the spectral data acquired.

11 Explain the principles of spectroscopy effectively in verbal form.

12 Write scientific report with relevant reference materials.

13 Explain the important components of industrial organic chemical processes

14 Analyze the relationship between process parameters and the output of any organic chemical process.

15 Communicate effectively in written and oral form through group discussion (assignment) and presentation session.

References

1. Yadav, L. D. S. (2005). Organic Spectroscopy, Anamaya Publishers, New
2. Kalsi, P. S. (2004). Spectroscopy of Organic Compounds, New Age Intern. Ltd Publishers, New
3. Pavia, D. L., Lampman, G. M. & Kriz, G.S. (2001). Introduction to Spectroscopy, Books/Cole, Australia.
4. Smith, J.G. (2008). Organic Chemistry, Mcgaw-Hill Intern.
5. Solomons, T. W. G. & Fryhle, C. B. (2008), Organic Chemistry, Wiley.
6. Pavia, D.L. (2000), Introduction to Spectroscopy (3rd Edition). USA: Thomson Brooks
7. Bruice, Paula Yurkanis. (2001), Oganic Chemistry Upper Saddle River. NJ: Prentice Hall. Thermodynamics, (7th Edition). Singapore: McGraw-Hill.

8. Plotkin Jeffrey S., Reuben Bryan G., Wittcoff Harold A.**Industrial organic chemicals 2. ed.** Hoboken, N.J. : Wiley-Interscience, cop. 2004 - xxxi, 662 s. ISBN: 0-471-44385-9 LIBRIS-ID: **9515911**
9. Arpe Hans-Jürgen**Industrial organic chemistry 5th, completely rev. ed.** Weinheim, Germany : Wiley-VCH, c2010 - xxi, 504 p. ISBN: 978-3-527-32002-8 LIBRIS-ID: **12044324**
10. Heaton, A., (1996). Ed., An Introduction to Industrial Chemistry (3rd ed.). Glasgow: Blackie Academic & Pro.
11. Austin, G. T. (1984). Shreve's Chemical Process Industries. (5th ed.). Singapore: Mc Graw Hill.
12. Wittcoff, H.A., Reuben, B.G., & Plotkin J.S. (2004). Industrial Organic Chemicals. (2nd ed). New Jersey: Wiley-Interscience.
13. Ali, M.F., El-Ali, B.M. & Speight, J.G. (2005). Handbook of Industrial Chemistry. New York: McGraw Hill.

Information about estimate, explanation of requisite work for each estimate:

№	Type of course and work of students	Amount, %
1.	Carrying-out of task for theme	27
2	Results of self work of students	15
3.	Lab.work	28
4.	Control work	30
	All:	100

Assessment on alphabetic	Digital equivalent of points	% the contents	Assessment on traditional system
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	
B-	2,67	75-79	
C+	2,33	70-74	Good
C	2,0	65-69	
C-	1,67	60-64	
D+	1,33	55-59	
D-	1,0	50-54	
F	0	0-49	
I (Incomplete)	-	-	"The discipline isn't complete" *(it isn't considered at calculation*
P (Pass)	-	-	"Is reckoned" *(it isn't considered at calculation*
NP (No Pass)	-	-	«It isn't reckoned» *(it isn't considered at calculation*
W (Withdrawal)	-	-	«Refusal of discipline» *(it isn't considered at calculation*
AW (Academic			Removal from discipline for the academic reasons
Withdrawal)			*(it isn't considered at calculation*
AU (Audit)	-	-	«The discipline is heard» *(it isn't considered at calculation*

Cert.		30-60 50-100	It is certified
Isn’t Cert.		0-29 0-49	It isn't certified
R (Retake)	-	-	Repeated studying of discipline

Lecture Kudaibergenova B.M.