

**ADDITIONAL EDUCATIONAL PROGRAM (MINOR)**  
**«CHEMIST- PERFUMER»**

**For whom it is intended:** The program (Minor) "Chemist- perfumer" is available to all students of KNWTTU. First-year students are given an introductory course, and students are required to choose at least two courses from the list of subjects.

The program (Minor) "Chemist- perfumer" is intended for students of all major educational programs studying in the field of training «6B01507-Chemistry».

**Relevance:** At a comprehensive course for training specialists in the field of cosmetics production, students receive theoretical and practical knowledge in the field of biological chemistry, cosmetology, study the composition and interaction of essential oils, and also acquire skills in other areas related to the production of cosmetics: perfumery; chemistry, microbiology, production technology; studies the technology of production of essential oils, prepares perfume compositions and herbal remedies. Students undergo a full course of training in the production of cosmetics and perfumes.

**Justification:** A future bachelor can take additional training courses on physical-chemical, perfumery-cosmetic laboratory research by choosing "Chemist-Perfumer" Minor. The program offers chemistry education at a high academic level based on an interdisciplinary approach.

**Purpose:** Formation of science-based principles and approaches among future specialists and in achieving a certain level of knowledge and skills necessary for their subsequent professional activities.

**Program Description:**

- 1.The program (Minor) "Chemist- perfumer" consists of 3 disciplines, each discipline has 5 credits, in total the student must master 15 credits.
- 2.The program (Minor) "Chemist- perfumer" does not require pre-requisites.
- 3.The number of credits for obtaining a bachelor's degree remains unchanged at least 240 credits.

**Program content:**

Name of the discipline	Description of the discipline	Teaching outcomes
Pharmaceutical and cosmetic technology (by industry)	Ability to formulate and solve problems in the field of pharmaceutical production technology, develop production regulations for the production of medicines, be able to organize, design, plan, supply chemical and pharmaceutical production.	LO 1 – can use knowledge in the field of technologies for the production of synthetic and natural medicines; LO 2 – has the skills to study the economics of the pharmaceutical industry, owns the general principles of management and marketing of the pharmaceutical industry; LO 3 – has the skills to study the economics of the pharmaceutical industry, owns the general principles of management and marketing of the pharmaceutical industry, knows analytical methods of drug synthesis and biological activity, master the field of phytochemistry and the basics of chemistry.
Technology of products from vegetable raw materials and perfumery and cosmetic products (by industry)	The course is aimed at introducing the basic principles of production of products from plant materials, perfumes and cosmetics, rational selection of drugs and excipients in dosage form, setting up machines and equipment for the pharmaceutical industry.	LO 1 – can use knowledge in the field of technologies for the production of synthetic and natural medicines; LO 2 – has the skills to study the economics of the pharmaceutical industry, owns the general principles of management and marketing of the pharmaceutical industry; LO 3 – has the skills to study the economics of the pharmaceutical industry, owns the general principles of management and marketing of the pharmaceutical industry, knows analytical methods of drug synthesis and biological activity, master the field of phytochemistry and the basics of chemistry.
Technology of essential oils and oils of the perfume and cosmetic industry	Technology of essential oils and oils of perfumery and cosmetic products, fields of application of essential oils in perfumery, cosmetics and medicine. Essential oils contain hydrocarbons, especially terpenes, alcohols, phenols, aldehydes, acids, esters, and some heterocyclic compounds. Essential oils	LO 1 – can use knowledge in the field of technologies for the production of synthetic and natural medicines; LO 2 – has the skills to study the economics of the pharmaceutical industry, owns the general principles of management and marketing of the pharmaceutical industry;

	are found in many plants, and they all have a characteristic odor similar to essential oils. Essential oils are soluble in alcohol, ether, benzene, poorly soluble in water, most are practically insoluble.	LO 3 – has the skills to study the economics of the pharmaceutical industry, owns the general principles of management and marketing of the pharmaceutical industry, knows analytical methods of drug synthesis and biological activity, master the field of phytochemistry and the basics of chemistry.
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### ADDITIONAL EDUCATIONAL PROGRAM (MINOR) «Chemical engineer»

**For whom it is intended:** The program (Minor) “Chemical engineer” is available to all students of KNWTTU. First-year students are given an introductory course, and students are required to choose at least two courses from the list of subjects.

The program (Minor) “Chemical engineer” is intended for students of all major educational programs studying in the field of training «6B01507-Chemistry».

**Relevance:** «Химик-инженер» мамандығы бойынша оқыту химия, мұнай және газ өңдеу өнеркәсібінде, медициналық мекемелерде, парфюмерлік заттарды (шикізат) химиялық, физика-химиялық, аналитикалық талдаумен байланысты зертханаларда жұмыс істеуге мүмкіндік береді. Сырттай қарағанда бұл өте тар сала болып көрінуі мүмкін, бірақ іс жүзінде химиялық процестер көптеген өнеркәсіптік салаларда қолданылады. Бұл пластмасса, синтетикалық талшықтар, бояғыштар, бояулар мен лактар, сабын, косметика, тұрмыстық химия, ауылшаруашылық өнімдері, дәрі-дәрмектер өндірісі болуы мүмкін. Мұндай маманға ұқсас профильдегі көптеген кәсіпорындар орналасқан қалада/ауданда жұмысқа орналасу мүмкіндігі жоғары. Зертханалық талдауды, заманауи химиялық және физика-химиялық талдау әдістерін, сараптаманың әр түрін нормативтік қамтамасыз етуді, парфюмерлік-фармацевтикалық талдау саласындағы мамандарға арналған кешенді оқу курсы.

**Justification:** A future bachelor can take additional training courses on physical-chemical, perfumery-cosmetic laboratory research by choosing ) “Chemical engineer” Minor. The program offers chemistry education at a high academic level based on an interdisciplinary approach.

**Purpose:** Formation of science-based principles and approaches among future specialists and in achieving a certain level of knowledge and skills necessary for their subsequent professional activities.

**Program Description:**

- 1.The program (Minor) ) “Chemical engineer” consists of 3 disciplines, each discipline has 5 credits, in total the student must master 15 credits.
- 2.The program (Minor) ) “Chemical engineer” does not require pre-requisites.
- 3.The number of credits for obtaining a bachelor's degree remains unchanged at least 240 credits.

**Program content:**

Name of the discipline	Description of the discipline	Teaching outcomes
(M) ChE 401/1 Petroleum and Gas Chemistry	In accordance with the development of modern technologies, a specialist in educational chemistry acquires comprehensive knowledge of the oil and gas industry and, in order to achieve success, learns to correctly understand the basic processes of oil refining, from the origin of oil to the drawings of installations used in oil refining, and to perform calculations based on them.	LO 1- can use knowledge in the field of production technology of synthetic and natural medicines; LO 2 - has the skills to study the economics of the pharmaceutical industry, is able to formulate the basic principles of management and marketing of the pharmaceutical industry; LO 3 – knows the basic methods of synthesis of drugs and biological activities of various structures, has knowledge in the field
(M) ChE 402/1 Electrochemistry	Electrochemistry studies the processes and phenomena that occur when electric current passes through substances with ionic conductivity (solutions, melts, solid electrolytes) in contact with electronic conductors (metals, semiconductors) and with each other. In the process of	LO 1 - can use knowledge of quantitative relationships of electrochemical thermodynamics and kinetics to describe and predict the properties of real systems.; LO 2– masters the basics of a scientific approach to solving problems related to

	studying the discipline, students master the chemistry of processes occurring in the presence of electric current and apply it in all areas of chemistry.	the practical application of electrochemical systems
<b>(M) ChP 403/1</b> Fundamentals of metrology and standardization	The special place of this course in student training is due to specifics of training specialists in modern conditions management. Under these conditions, the role and responsibility increases personnel in the competent application of metrology, standardization and certification. Compliance with metrological rules in various fields human activity will allow to minimize material losses from unreliable measurement results.	LO 1 - understanding the essence of metrological support and control uniformity of measurements; LO 2- defining the role of standardization and certification in increasing quality of products or services; LO 3- knowledge of basic concepts related to objects and means measurements, form of processing and presentation of measurement results;