ASIIN Certification Report

PhD Programmes
Technical Chemistry of Inorganic Substances
Technical Chemistry of Organic Substances
Technical Chemistry of Explosives and Pyrotechnical Produce
Nanomaterials and Nanotechnology
Petrochemistry
Chemistry

Provided by
al-Farabi Kazakh National University

Version: 11 November 2014

Table of Content

A About the Certification Process

Title of the PhD Programme	**Previous ASIIN certification**
PhD in Technical Chemistry of Inorganic Substances PhD in Technical Chemistry of Organic Substances PhD in Technical Chemistry of Explosives and Pyrotechnical Produce PhD in Nanomaterials and Nanotechnology PhD in Petrochemistry PhD in Chemistry	n/a
Date of the contract: 25th of December 2012 **Submission of the final version of the self-assessment report:** 17th of February 2014 **Date of the onsite visit:** 9th of July 2014 **at:** al-Farabi Kazakh National University, Almaty, Kazakhstan	
Peer panel: Prof. Dr. Heinrich Lang, Technical University Chemnitz; Prof. Dr. Reinhard Schomäcker, Technical University Berlin; Prof. Dr. Gerolf Marbach, University of Applied Sciences Esslingen; Roy Seeland, Shell Deutschland Oil GmbH; Ekaterina Astafyeva, student of South Kazakhstan State University	
Representative of the ASIIN headquarter Dr. Georg Ebertshäuser	
Responsible decision-making committee: Certification committee	
Criteria used: European Qualifications Framework for Lifelong Learning *(level 8)*	

Standards for the Certification of (Further) Education and Training for courses and modules related to Computer Sciences, Technology, Natural Sciences and Business Economics as of 27.07.11.

European Standards and Guidelines as of 2009 (3rd edition).

In order to facilitate the legibility of this document, only masculine noun forms will be used hereinafter. Any gender-specific terms used in this document apply to both women and men.

B Characteristics of the PhD Programme

a) Name of the programme	b) Degree awarded upon conclusion	c) Mode of Study	d) Duration & Credit Points	e) First time of offer & Intake rhythm	f) Number of students per intake	g) Fees
PhD in Technical Chemistry of Inorganic Substances	Ph.D.	Full time	6 Semester 125 CP (ECTS, only coursework is credited)	Sep 2009, each year in September	5 students (in 2012)	
PhD in Technical Chemistry of Organic Substances	Ph.D.	Full time	6 Semester 125 CP (ECTS, only coursework is credited)	Feb 2010, each year in September	2 students (in 2013)	
PhD in Technical Chemistry of Explosives and Pyrotechnical Produce	Ph.D.	Full time	6 Semester 125 CP (ECTS, only coursework is credited)	Sep 2008, Each year in September	2 students (in 2013)	
PhD in Nanomaterials and Nanotechnology	Ph.D.	Full time	6 Semester 125 CP (ECTS, only coursework is credited)	Sep 2010, each year in September	1 students (in 2012)	
PhD in Petrochemistry	Ph.D.	Full time	6 Semester 125 CP (ECTS, only coursework is credited)	Sep 2013, each year in September	not stated	
PhD in Chemistry	Ph.D.	Full time	6 Semester 125 CP (ECTS, only coursework is credited)	Feb 2005, each year in September	4 students (in 2013)	

For the PhD-Programme in Technical Chemistry of Inorganic Substances the self-evaluation report states the following **intended learning outcomes**:

knowledge
modern state and perspectives of development of a technology of inorganic and modern meth-

ods of obtaining new materials
methods of research in the field of synthesis of new inorganic materials and the development of new processes for their manufacturing
the methods of mathematical modeling, theoretical and experimental investigations of chemical technology of inorganic substances.
perspective types of raw materials, to analyze state and to develop methods for modernization of the technology of current enterprise
methodological approaches to exercise their critical analysis and, if appropriate, propose new ways of improvement of the existing technologies

understanding
current trends and prospects of development of scientific research aimed at getting new perspective of inorganic substances and materials as well as the technology of their industrial production
nature and social significance of the profession, the basic problems of disciplines that define a specific area of operation, to see their relationship in a holistic system of knowledge
essence of politics, social, legal and moral foundations of society
methods of conducting high-quality original scientific research, create and interpret new knowledge meeting the requirements of expert evaluation in this field of scientific knowledge (peer-review) contributing to the development of the scientific sector
promising approaches and methods for the preparation of new inorganic materials that meet the requirements of modern science and technology development

application
demonstrate chemistry proficiency in all four disciplines of chemistry: analytical, inorganic, organic, and physical
apply knowledge of design principles to industrial chemical systems
apply computer skills relevant to the chemical engineering technology field
apply problem-solving skills to chemical engineering technology

analysis
interpret manual and instrumental quantitative and qualitative analyses* and tests accurately using prescribed laboratory procedures
analyze the operation of industrial chemical processes
perform relevant Quality Assurance and Quality Control procedures
analyze patterns of chemical process to apply modern methods of theoretical and experimental research, to provide descriptions of typical chemical engineering processes, to interpret the meaning of the obtained results
processes, identify measures to ensure their safety, to calculate the parameters of technological processes, choose the equipment and the rational scheme of production, to identify objects to improve in the known technologies

synthesis
perform statistical calculations to report the results of analyses and tests

prepare organic and inorganic compounds using standard synthetic* and purification procedures
use interpersonal and communication skills appropriate to the chemical engineering technology environment
design of new technological schemes of production of inorganic substances and materials, selection of process parameters, calculation and selection of equipment
implementation of the process in accordance with the requirements of technological regulations in the production of inorganic substances and materials

evaluation
qualification review on complex problems in chemical technology, often, at the absence of excessive data
integrate the knowledge and solve complex problems, formulate judgments with incomplete or limited information
identification and analysis of the properties of the used and obtained inorganic materials
access the results of an experimental study of physical chemical and technological properties of raw materials and final products, quality assessment of natural and man-made materials
critically evaluate the problems, approaches and trends in the processing of mineral raw materials; critically evaluate current research in the field of technology of inorganic substances

The following **curriculum** is presented:

6D072000 - Chemical technology of inorganic substances
Academic degree: PhD in Technical sciences

Title of modules	Course code	**Title of courses**	Credit	**ECTS credits**	**Lec/ prac/ Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module (3 credits)	NOTTSMAT 7201	Scientific Fundamentals of Engineering and Technology, Modern Machines and Devices in the Technology	3	5	2+1+0	1
2. Elective Modules of Professional Specialization (6 credits)	***Technology of processing of mineral resources***					
	SATOTPPMS 7202	Modern aspects and theoretical basics of the tchnology of processing of polymetallic mineral resources of the RK	3	5	1+2+0	1
	TARTONS 7203	Thermodynamic Analysis of Reactions in the Technology of Basic Inorganic Synthesis	3	5	1+2+0	1
	Technology of electrochemical production					
	SATPCM	Modern Aspects of the Technology of	3	5	1+2	1

	7202	Pure Materials Production			+0	
	MPNN 7203	Methods of Obtaining of Inorganic Nanomaterials	3	5	1+2 +0	1
	Inorganic substances and materials					
	SMPNVM 7202	Special Methods for Inorganic Substanc-es and Materials	3	5	1+2 +0	1
	TKMIHTP 7203	Thermodynamic and Kinetic Methods for Studying Chemical-Technological Processes	3	5	1+2 +0	1
4. Additional Types of Training (2 credits)	NIRM I	Doctoral Student's Reseach Work and Fullfilment of Dissertation	2	3	2	1
Semester 2						
2. Elective Modules of Professional Specializa-tion (9 cred-its)	***Technology of processing of mineral resources***					
	STPARS 7204	Modern Technologies of Processing and Analysis of Rare-Metal Raw Materials	3	5	1+2 +0	2
	AVEPVS 7205	Topical issues of the ecology and pro-cessing of secondary resources	3	5	1+2 +0	2
	PEOH 7206	Planning the experiment and basics of chemometrics	3	5	1+2 +0	2
	Technology of electrochemical production					
	SATOEP 7204	Modern aspects and theoretical basics of electrochemical productions	3	5	1+2 +0	2
	APEEP 7205	Topical problems of ecology of eletrochemical productions	3	5	1+2 +0	2
	APVBMET 7206	Actual problems of introduction of wasteless and low waste electrochemi-cal technologies	3	5	1+2 +0	2
	Inorganic substances and materials					
	TONS 7204	Technology of Basic Inorganic Synthesis	3	5	1+2 +0	2
	SARZB 7205	Modern aspects of radiation protection and safety	3	5	1+2 +0	2
	TKSM 7206	Technology of silicate composite mate-rials	3	5	1+2 +0	2
4. Additional Types of Training (5,5 credits)	NIRM II	Doctoral Student's Reseach Work and Fullfilment of Dissertation	3.5	6	2+1,5	2
	IP	Research internship	2	3	2	2

Semester 3						
3. Modules of Individual Educational Paths (9 credits)	***Technology of processing of mineral resources***					
	3.1 Technology of Processing of Mineral Resources		**6**	10		
	MIREPO 8301	Methods for Extraction of Rare Elements From Industrial Waste	3	5	1+2+0	3
	UMHTM 8302	Carbon Materials in Chemical Technology and Metallurgy	3	5	1+2+0	3
	3.2 Metrology and technology of rare earth and noble metals		**6**	**10**		
	STPRBM 8303	Modern Technologies of Rare Earth and Noble Metals Production	3	5	1+2+0	3
	Technology of electrochemical production					
	3.1 Eletrode materials and corrosion processes		**6**	10		
	MIKP 8301	Methods of Investigation of Corrosion Processes	3	5	1+2+0	3
	SEMEE 8302	Modern electrode materials in electroanalysis and electrotechnology	3	5	1+2+0	3
	3.2 Obtaining of metals from melted and non-aqueous solutions		**6**	10		
	TOPMNR 8303	Theoretical Foundations of Obtaining Metals from Non-Aqueous Solutions	3	5	1+2+0	3
	Inorganic substances and materials					
	3.1 Technology of Inorganic Substances and Materials		**6**	10		
	TMU 8301	Fertilizer Technology	3	5	1+2+0	3
	TPAN 8302	Theoretical and Applied Aspects of Nanochemistry	3	5	1+2+0	3
	3.2 Hydrochemical Processesand inorganic polymers		**6**	10		
	NP 8303	Inorganic Polimers	3	5	1+2+0	3
4. Additional Types of Training (5 credits)	NIRM III	Doctoral Student's Reseach Work and Fullfilment of Dissertation	2	3	2	3
	PP	Pedagogical Internship	3	5	3	3
Semester 4						
3. Modules of Individual Educational Paths (18	***Technology of processing of mineral resources***					
	3.2 Metrology and technology of rare earth and noble metals		**6**	**10**		
	HMH 8304	Chemical Metrology and Chemimetrics	3	5	1+2+	4

credits)					0	
	3.3 Methods of obtaining and analysis of rare and polymetals		**6**	10		
	STPP 8305	Modern technologies of polymetals	3	5	1+2+0	4
	SEMARM 8306	Modern electrochemical methods of analysis of rare metals	3	5	1+2+0	4
	Technology of electrochemical production					
	3.2 Obtaining of metals from melted and non-aqueous solutions		**6**	10		
	ETVMRS 8304	Electrochemical technology of separation of metals from melted media	3	5	1+2+0	4
	3.3 Technics and control of electrochemical technologies		**6**	10		
	SEMKTP 8305	Modern electrochemical methods of controlling of technological processes	3	5	1+2+0	4
	ETTPMS 8306	Electrochemical technological and technics in processing of mineral resources	3	5	1+2+0	4
	Inorganic substances and materials					
	3.2 Hydrochemical Processesand inorganic polymers		**6**	10		
	FHOGP 8304	Physico-Chemical Bases of Hydrochemical Processes	3	5	1+2+0	4
	3.3 Actual problems of the technology of inorganic substances and uranium technology		**6**	10		
	PPRHP 8305	A forecasting and prediction of development of chemical technology	3	5	1+2+0	4
	APHTU 8306	Actual problems of chemical technology of uranium	3	5	1+2+0	4
4. Additional Types of Training (7,5 credits)	NIRM IV	Master's Reseach Work and Fullfilment of Dissertation	6,5	11	2+1,5+3	4
	IP	Research internship	1	2	1	4
Semester 5						
4. Additional Types of Training (2 credits)	NIRM V	Doctoral Student's Reseach Work and Fullfilment of Dissertation	2	3	2+3	5
Semester 6						
4. Additional Types of Training (9 credits)	NIRM VI	Doctoral Student's Reseach Work and Fullfilment of Dissertation	9	15	2+7	6

5. Final Attestation (5 credits)	KE	Complex Examination	1	2	1	6
	ZD	Dissertation Fullfilment and Defence	4	7	4	6

For the PhD-Programme in Technical Chemistry of Organic Substances the self-evaluation report states the following **intended learning outcomes**:

knowledge
1.Know the content, significance and organic substance of the underlying definitions
2. Determine the object and methods of study
3. On the basis of this overview, each graduate school should prepare organic compounds using standard synthetic and purification procedures
4. Apply knowledge of design principles to industrial chemical technology systems.
5. Analyze the operation of industrial chemical technological processes
6. On the basis of this overview, each graduate school should prepare guidelines for the knowledge dissemination aspects of its PhD programmes, including guidelines for requirements with regard to the extent of compulsory knowledge dissemination activities

understanding
1. A PhD student could demonstrate research work in the area in which they did not pass examination in January, if necessary, in the following June.
2. A PhD student could enroll in an approved graduate course in the area.
3. A student could understand characteristics of the formation the PhD program of the chair of chemistry and technology of organic matters, natural compounds and polymers.
4. Classify the resulting information for planning and forecasting.
5. Discuss the correctness of the valuation of knowledge.

application
1. Develop proficiency in the critical analysis of scientific research problems
2.choose forms, methods and means of chemistry technology information
3 . apply the modern information technology in chemistry
4 . Illustrate the results of chemical technology
5 . interpret the theoretical and practical aspects of the basic chemistry
6. understand the knowledge the skills to solve problems in the synthesis, measurement and modeling of chemical systems.
7. Solve situational problems on practical materials organizations
8. Use tables and graphs for analysis of research work

analysis
1. Analyze the raw data for the compilation of chemical technology
2. Evaluate the results of the Advanced statistical methods

3. calculate generalized indicators and statistical values
4. Analysis of data from other stations, combining different datasets
5. develop a plan for continued professional growth in the field of chemistry
6. Distinction between scientific tools used in accounting
7. Differentiate situations and approaches to solving problems

the synthesis
1. Organize and conduct monitoring of problem-solving skills to chemical laboratory technology problems
2. Constitute forms of financial statements in accordance with international standards
3. Create a strategy for the analysis of chemical concepts to tasks, such as the analysis and synthesis of chemical compounds and samples and to develop approaches and techniques for the solution of problems
4. Develop a quantitative and qualitative analyses using prescribed laboratory procedures
5. Formulate goals and objectives for chemical technology
6. To organize conferences, debates, special courses and round-table discussions on issues of concern
7. Apply knowledge of design principles to industrial chemical systems
8. Plan the acquisition, storage and release of stocks in the production of
9. Propose possible scientific methods of learning to achieve goals

evaluation
1. Determine the results of work on account of the process and laboratory equipment
2 . Discuss and Analyze of operation of industrial chemical technology processes of the Republic of Kazakhstan
3 . Operate chemical processes
4 . Perform the results to report and evaluate the results of analyses.
5 . Protect the received digital data , applied methods and techniques
6. Evaluate the significance of the taken results

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**ECTS/hours**	**Lec/prac/Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module(3credits)	KPUS	Complex Processing of Hydrocarbonic Raw Materials	3	3/135	1+2+0	1
2. Elective Module of Professional Specialization 1 Specialized Compulsory Module 1 (3credits)						
	SODOS 7201	Structure-Oriented Design of Organic Compounds	3	3/135	1+2+0	1
Elective Module of Professional Specialization 2 (3 credits)						
	ODNSOH 7203	One-Dimensional and Two-Dimensional Spectroscopy of Nuclear Magnetic Resonance in Organic Analysis	3	3/135	1+2+0	1
Additional Types ofTraning	**Doctoral Student's Research Work and Fulfilment of Dissertation**					
	NIRD I	Research Seminar I	1			1
Semester 2						
Elective Module of Professional Specialization 3 Specialized Compulsory Module 1 (3 credits)	SPKPPN 7203	Modern Problems of Complex Processing Petrochemistry Products	3	3/135	1+2+0	2

Elective Module of Professional Specialization 4 Specialized Compulsory Module 1(3 credits)	HHTUBK 7204	Chemistry and Chemical Technology of Carbohydrates-Albuminous Complexes	3	3/135	1+2+0	2
Elective Module of Professional Specialization 5 (3 credits)	SABH 7305	Modern aspects of Bioorganic Chemistry	3	3/135	1+2+0	2
Additional Types ofTraning	**Doctoral Student's Research Work and Fulfillment of Dissertation**					
	NIRD II	Research Seminar II	1(3+4)			2
Additional Types ofTraning	**Professional Practice**					
	IP	Research practice	3(2+1)			2
Semester 3						
Name of modules	Disciplin ecode	**Title of courses**	Credit	**ECTS / hours**	**Lec /prac/ Lab.**	**Sem.**
3. Module of Individual Educational Path 1 MIOT 1 (3 credits)	**Module 6 The Mass Spectral and chromatographic Analysis of Organic Molecules (6D072101-Organic chemistry)**					
	MSAOM 8301	Mass spectral analysis of organic molecules	3	3/135	1+2+0	3
	SMHAOS 8302	Modern methods for the chromatographic analysis of organic compounds	3	3/135	1+2+0	3
	Module 7 Chemistry and Chemical Technology of pharmaceuticals (6D072102-Chemistry of Natural Compounds)					

	HHTUBK 8301	Chemistry and Chemical technology of terpenoids	3	3/135	1+2+0	3
	HHTP 8302	Chemistry and Chemical tehnology of proanthocyanidins	3	3/135	1+2+0	3
Module of Individual Educational Path 2 MIOT 2	**Module 8 Mechanisms of Reactions in Organic Chemistry and Construction of synthetic nanofarmakological compounds (6D072101-Organic chemistry)**					
	MROH 8303	Mechanisms of Reactions in Organic Chemistry	3	3/135	1+2+0	3
	Module 9 Standartization of Medical products(6D072102-Chemistry of Natural Compounds)					
	SKBAVF 8303	Standardization and control of BAS herbal remedies	3	3/135	1+2+0	3
Additional Types ofTraning	**Doctoral Student's Research Work and Fulfillment of Dissertation**					
	NIRD III	Research Seminar III	1	2/90		3
Additional Types ofTraning	**Professional Practice**					
	PP	Pedagogical Practice	3	3/135		3
	4 Modules for Individual Educational Trajectories **(IET)**					
	MIOT 1 **The Mass Spectral and chromatographic Analysis of Organic Molecules**		**MIOT 2** **Mechanisms of Reactions in Organic Chemistry and Construction of synthetic nanofarmakological compounds**			
	6D072101-Organic chemistry	**6D072102-Chemistry of Natural**	**6D072101-Organic chemistry**	**6D072102-Chemistry of Natural**		

		Com-pounds		**Com-pounds**				
	MSAOM 8301 Mass spectral analysis of organ-ic mole-cules	HHTUBK 8301 Chemistry and Chemical technolo-gy of terpenoid s	MROH 8303 Mecha-nisms of Reactions in Organ-ic Chem-istry	SKBAVF 8303 Standardi zation and control of BAS herbal remedies	3	3/13 5	1+2 +0	3
	SMHAOS 8302 Modern methods for the chroma-tographic analysis of organ-ic com-pounds	HHTP 8302 Chemistry and Chemical tehnology of proantho cyanidins			3	3/13 5	1+2 +0	3

Semester 4

Name ofmodules	Disciplin ecode	**Title of courses**	Credi t	**EC TS/ ho urs**	**Lec/pr ac/La b.**	**S e m .**
Module of Individual Educational Path 2 MIOT 1	**Module 8 Mechanisms of Reactions in Organ-ic Chemistry and Construction of synthetic nanofarmakological compounds (6D072101-Organic chemistry)**					
	KSNSOH 8304	Construction of synthetic nanofarmakological compounds in organic Chemistry	3	3/1 35	1+2+0	4
	Module 9 Standartization of Medical products(6D072102-Chemistry of Natural Compounds)					
	IFPRP	Quantitative estimation of operating substances in medical	3	3/1 35	1+2+0	4

	8304	products				
Module of Individual Educational Path 3 MIOT 3	**Module 10Chemistry and Technology of the organic-minerals compositions (6D072101-Organic chemistry)**					
	HTOMK 8405	Chemistry and Technology of the organic-minerals compositions	3	3/135	1+2+0	4
	PSPE 8406	Polycomplexes synthetic polyelectrolytes	3	3/135	1+2+0	4
	Module 11 Biologically Active substances of phytogenesis (6D072102-Chemistry of Natural Compounds)					
	SABH 8305	Creation and Manufacturing soft medicinal forms	3	3/135	1+2+0	4
	FHPLV 8306	Pharmaceutical chemistry of natural drugs	3	3/135	1+2+0	4
Additional Types ofTraning	**Doctoral Student's Research Work and Fulfilment of Dissertation**					
	NIRD IV	Research Seminar IV	1(3+4)			4
Additional Types ofTraning	**Professional Practice**					
	IP	Research practice	3(2+1)			4
	4 Modules for Individual Educational Trajectories **(IET)**					
	MIOT 2 Mechanisms of Reactions in Organic Chemistry and Construction of synthetic nanofarmakological compounds		**MIOT 3 Chemistry and Technology of the organic-minerals compositions**		3	3/135	1+2+0	
	6D072101-Organic chemistry	**6D072102-Chemistry of Natural**	**6D072101-Organic chemistry**	**6D072102-Chemistry of Natural**	3	3/135	1+2+0	

		Com-pounds		**Com-pounds**				
	KSNSOH 8304 Con-struction of synthet-ic nanofarma kological com-pounds in organic Chemistry	IFPRP 8304 Quantitat ive estimatio n of operating substance s in medical products	HTOMK 8405 Chemis-try and Technol-ogy of the organic-minerals composi-tions	SABH 8305 Creation and Manu-facturin g soft medici-nal forms	3	3/1 35	1+2+0	4
			PSPE 8406 Polycomp lexes syn-thetic polyelec-trolytes	FHPLV 8306 Pharma-ceutical chemis-try of natural drugs	3	3/1 35	1+2+0	4
Semester 5								
Additional Types ofTraning	**Doctoral Student's Research Work and Ful-filment of Dissertation**				Minimum of 6 credits			
	NIRD V	Research Seminar V			1			5
Additional Types ofTraning	**Final Certification**							
	KE	Complex Examination			1			
	ZD	Dissertation Fulfillment and Defence			3			

For the PhD-Programme in Technical Chemistry of Explosives and Pyrotechnical Produce the self-evaluation report states the following **intended learning outcomes**:

knowledge

1. Identify and know the methodological foundations enhance the cognitive activity in the disciplines of chemistry and technology of explosives and pyrotechnics in order to develop the capacity to understand and manage the environment. The ability to efficiently organize your time to build learning strategies, make decisions and solve problems.
2. Know the general theoretical and experimental principles and methods of chemical technology of explosives and pyrotechnics.

understanding
1. Discuss and solve a wide range of well-known problems of combustion and explosion of technology and tackle the implicit and unresolved issues.
2. Explain and collate, analyze and interpret complex experimental data and draw conclusions.

application
1. Internship and develop and deepen their knowledge and acquire new skills in a professional manner.
2. Apply their knowledge to solve problems of research and applied.

analysis
1. Critical thinking ability of the cognitive processes of design implementation scenarios to ensure the production of ideas.

the synthesis
1. Be able to assess the methodological approaches, to exercise their critical analysis and if necessary, propose new hypotheses.
2. Have a systemic understanding, allowing critically evaluate current research and theory in the field of scientific knowledge.

evaluation
1. Possess understanding of the system, which allows to critically evaluate current research and theory in the field of scientific knowledge.
2. Discuss about the current trends in improving explosives and fireworks, the place and role of chemical engineering in the development of science, technology and production.

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ECTS/ hours	Lec /prac /Lab.	Sem
State Compulsory Module (3 credits)	SPPGD V 7201	Modern problems of processes burning, detonation, explosion	3	5/135	2+1+0	1
Module name (15 credits)	Educational Program6D073401-Pyrotechnic means		Credit	ECTS/ hours	Lec/prac/Lab.	Sem.
The promise of productions	SSPRPIPVI 7202	Current state and prospects of the development, production and use of pyrotechnic materials and products	3	5/135	2+1+0	1
Preparation of materials	PMIVG 7203	Preparation of materials and products in the combustion wave	3	5/135	2+1+0	1
Properties of pyrotechnic compositions	FCHSPSMI 7204	Physicochemical properties of pyrotechnic compositions and methods of testing	3	5/135	2+1+0	2
Prizvodstvennaya activity in pyrotechnics	APEPPD 7205	Analysis of the prediction of environmental impacts of industrial activity	3	5/135	2+1+0	2
Dangerous factors of production	VOVFPPSZ 7206	Dangerous and harmful factors on the production of pyrotechnics	3	5/135	2+1+0	2
Modules of Individual Educational Paths – 18 credits	Educational Program "Manufacture of fireworks"		Credit	ECTS/ hours	Lec /prac /Lab.	Sem
MIOT 1 The technology production	PTPPI 8301	Industrial production technology of pyrotechnics	3	5/135	2+1+0	3
	TPISVS 8302	Technology in pyrotechnics using self-propagating high-temperature synthesis	3	5/135	2+1+0	3
MIOT 2 Design and Planning	KPI 8303	Construction of pyrotechnics	3	5/135	2+1+0	3
	PPPS 8304	Production Planning of pyrotechnics	3	5/135	2+1+0	4
MIOT 3 Legislative of monitoring	MLPI 8305	Methods for elimination of pyrotechnics	3	5/135	2+1+0	4
	ZAPS 8306	Legislation acts on pyrotechnics	3	5/135	2+1+0	4
Modules of Individual Educational Paths – 18 credits	Educational Program "Igniter pirosostavy"		Credit	ECTS/ hours	Lec /prac /Lab.	Sem
MIOT 1 Appointment of pirostructures	NPS 8301	Assignment on pyrotechnics	3	5/135	2+1+0	3
	PUPS 8302	Products that are used in pyrotechnic compositions	3	5/135	2+1+0	3
MIOT 2 Thermodynamics of pirostructures	TKGPS 8303	Thermodynamics and kinetics of combustion of fireworks	3	5/135	2+1+0	3
	VSS	Igniter means and composi-	3	5/135	2+1+0	4

	8304	tions				
MIOT 3 Combustible of pirostructures	KPSBP 8305	Classification of fireworks in combat use	3	5/135	2+1+0	4
	FChSGPS 8306	Physico-chemical properties of combustible pyrotechnic compositions	3	5/135	2+1+0	4
Module name (15 credits)	Educational Program 6D073402-Explosives means		Credit	ECTS/ hours	Lec /prac /Lab.	Sem.
Practical application	VVPG 7202	Explosives used in mining	3	5/135	2+1+0	1
Theoretical foundations	TSPVV 7203	The theory and properties of industrial explosives	3	5/135	2+1+0	1
Promising the production	SPPIVV 7204	Status and future production and use of explosives	3	5/135	2+1+0	2
Technology initiation	ChTIVV 7205	Chemistry and Technology of initiating explosives	3	5/135	2+1+0	2
Prevention of accidents	OVFPVV 7206	Dangerous and harmful factors on the production of explosives	3	5/135	2+1+0	2
Modules of Individual Educational Paths – 18 credits	Educational Program "Manufacture of explosives"		Credit	ECTS/ hours	Lec /prac /Lab.	Sem
MIOT 1 Gunpowder and Explosives	PTPVV 8301	Industrial production technology of explosives	3	5/135	2+1+0	3
	PVV 8302	Gunpowder and explosives	3	5/135	2+1+0	3
MIOT 2 Brisance and initiation of substance	RBVV 8303	Workability and the high explosives	3	5/135	2+1+0	3
	IVV 8304	Initsiruyuschie explosives	3	5/135	2+1+0	4
MIOT 3 Resistance and sensitivity	ShVVNI 8305	The sensitivity of explosives and the initial momentum	3	5/135	2+1+0	4
	SVPOSVV 8306	Speed of explosive transformations and definition of resistance explosives	3	5/135	2+1+0	4
Modules of Individual Educational Paths – 18 credits	Educational Program "Combustion and Explosion"		Credit	ECTS/ hours	Lec /prac /Lab.	Sem
MIOT 1 The theory of combustion and explosion	GVSR 8301	Burning explosion in the steady state	3	5/135	2+1+0	3
	UPVV 8302	Conditions and parameters of the origin of explosions	3	5/135	2+1+0	3
MIOT 2 The diffusion combus-	DGGST 8303	Diffusion combustion of homogeneous and mixed fuels	3	5/135	2+1+0	3

tion of mixed fuels	TVIERV 8304	Thermal explosion isolated exothermic reactants	3	5/135	2+1+0	4
MIOT 3 The specific volume of the explosion products.	MPV 8305	Macrokinetic the parameters of explosion	3	5/135	2+1+0	4
	RDUVV 8306	The devastating effect of the explosion shock wave	3	5/135	2+1+0	4
Doctoral Student's Reseach Work and Fullfilment of Dissertation 28 credits		Additional Types of Training	Minimum of 7 credits			Sem.
	NIRD I	Research Seminar I	1			1
	NIRD II	Research Seminar II	1(+3+4)			2
	NIRD III	Research Seminar III	1			3
	NIRD IV	Research Seminar IV	1(+4+3)			4
	NIRD V	Research Seminar IV	1			5
	NIRD VI	Research Seminar IV	1(+8)			6
Professional Internship 6 credits	PP	Pedagogical Internship	3	5/135		3
	IP	Research internship	2+1	5/135		2, 4
Final Attestation 5credits	KE	Complex Examination	1	1/45		6
	ZD	Dissertation Fullfilment and Defence	4	6/180		6
TOTAL			59			

For the PhD-Programme in Nanomaterials and Nanotechnology the self-evaluation report states the following **intended learning outcomes**:

knowledge

1. To generate in students the ability to carry out a confident choice for future professional activities and successfully employed in their chosen field.
2. Ensure mastery of the practical means and the computing skills.

understanding

1. Graduates must complete a major research project that requires in-depth practical and theoretical knowledge, providing original innovative result.
2. Graduates should be prepared for professional careers related to the conduct of research in the sectors of industry, based on the application of knowledge in the field of nanotechnology and nonmaterial's.

application

1. Use the knowledge gained in the study of basic and elective courses at the rate of nanotechnology and nanomaterialoy decision making in key areas of practice.
2. Information technology for document creation and preservation of information on critical areas of chemical engineering, including nanotechnology and nonmaterials.

analysis
1. The ability to solve a wide range of known issues of nanotechnology and tackle the implicit and unresolved issues.
2. The ability to solve problems of nanotechnology and nonmaterial's in different contexts, and the ability to communicate between the problems and the basic principles.

the synthesis
1. Have an idea of chemical nanoreactors.
2. To have an idea of cryochemistry of atoms and nanoparticles of metals.

evaluation
1. The ability to integrate knowledge, to cope with the complexities, as well as to form judgments on the basis of incomplete or limited information, based on ethical and social responsibility for the application of this knowledge and judgment.
2. The ability to generate ideas for new or unfamiliar situations, the ability to hold a creative approach to solving the subject and interdisciplinary problems.

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ECTS/ hours	Lec /prac /Lab.	Sem
State Compulsory Module (3 credits)	FHON 7201	Physico-chemical bases of nanotechnology	3	5/135	2+1+0	1
Module name (15 credits)	Educational Program 6D074002 – Functional Nanomaterials		Credit	ECTS/ hours	Lec/prac/Lab.	Sem.
Morphology, structure and properties	MSSUN 7202	Morphology, structure and properties of carbon containing nanomaterials	3	5/135	2+1+0	1
Physical and chemical properties	FHSN 7203	Physical and chemical properties of nanomaterials	3	5/135	2+1+0	1
Self-propagating high-temperature synthesis	SVSNM 7204	Self-propagating high-temperature synthesis of nanostructure materials	3	5/135	2+1+0	2
Physical and chemical bases	FHOPUN 7205	Physical and chemical bases of reception carbon nanomaterials	3	5/135	2+1+0	2
Modern technologies	STPNN 7206	Modern technologies of reception nanoobjects and nanostructures	3	5/135	2+1+0	2
Modules of Individual Educational Paths – 18 credits	Educational Program Modules of Individual Educational Paths		Credit	ECTS/ hours	Le /prac /Lab.	Sem
MIOT 1 Tehologies of receiving nanomaterials	NM 8301	Nanostructure materials	3	5/135	2+1+0	3
	ON 8302	Volume nanomaterials	3	5/135	2+1+0	3
MIOT 2 Methods investigation of nanomaterials	PhMN 8303	Physical methods of research in nanotechnology	3	5/135	2+1+0	3
	OUNGU 8304	Formation carbon nanostructures at burning of hydrocarbons	3	5/135	2+1+0	4
MIOT 3 Application of nanomaterials	NNM 8305	Nanotechnology and nanomaterials in medicine	3	5/135	2+1+0	4
	EN 8306	Nanomaterials in electronics	3	5/135	2+1+0	4
Module name (15 credits)	Educational Program 6D074001- Nanotechnologies and nanosystems		Credit	ECTS/ hours	Lec /prac /Lab.	Sem.
Morphology, structure and properties	MSSUN 7202	Morphology, structure and properties of carbon containing nanomaterials	3	5/135	2+1+0	1
Physical and chemical	FHSN	Physical and chemical proper-	3	5/135	2+1+0	1

properties	7203	ties of nanomaterials				
Self-propagating high-temperature synthesis	SVSNM 7204	Self-propagating high-temperature synthesis of nanostructure materials	3	5/135	2+1+0	2
Physical and chemical bases	FHOPUN 7205	Physical and chemical bases of reception carbon nanomaterials	3	5/135	2+1+0	2
Modern technologies	STPNN 7206	Modern technologies of reception nanoobjects and nanostructures	3	5/135	2+1+0	2
Modules of Individual Educational Paths – 18 credits	Modules of Individual Educational Paths		Credit	ECTS/ hours	Lec /prac /Lab.	Sem
MIOT 1 Chemical aspects of synthesis nanomaterials	NOPA 8301	Nanochemistry, bases and applied aspects	3	5/135	2+1+0	3
	NMHN 8302	Nanoparticles of metals and chemical nanoreactors	3	5/135	2+1+0	3
MIOT 2 Modern methods of investigation in nanotechnology	MIDNN 8303	Methods of research and diagnostics of nanoobjects and nanosystems	3	5/135	2+1+0	3
	OFNGU 8304	Formation of fullerens and nanostructures at burning of hydrocarbons	3	5/135	2+1+0	4
MIOT 3 Application of nanomaterials	BIB8305	Bionanomaterials and bionanotechnology	3	5/135	2+1+0	4
	PRN 8306	Perspective development of nanotechnologies	3	5/135	2+1+0	4
Doctoral Student's Reseach Work and Fullfilment of Dissertation 28 credits		Additional Types of Training	Minimum of 7 credits			Sem.
	NIRD I	Research Seminar I	1			1
	NIRD II	Research Seminar II	1(+3+4)			2
	NIRD III	Research Seminar III	1			3
	NIRD IV	Research Seminar IV	1(+4+3)			4
	NIRD V	Research Seminar IV	1			5
	NIRD VI	Research Seminar IV	1(+8)			6
Professional Practice 6 credits	PP	Pedagogical Practice	3	5/135		3
	IP	Research practice	2+1	5/135		2, 4
Final Attestation 5credits	KE	Complex Examination	1	1/45		6
	ZD	Dissertation Fullfilment and Defence	4	6/180		6
TOTAL			59			

For the PhD-Programme in Petrochemistry the self-evaluation report states the following **intended learning outcomes**:

I. Knowledge

1. Knowledge of the basic receptions and methods of researches in the field of petrochemistry and their application in practical activities
2. Knowledge of the general theoretical and experimental principles and petrochemistry methods.
3. Possession of a wide spectrum of knowledges in all areas of petrochemistry from the theory and practice to modern technologies and petrochemistry and oil refining catalysts.
4. Knowledge of serious experimental procedures, including data recording, the analysis and experiment planning.
5. Knowledge of used mathematical methods, their application at chemical calculations and modeling of petrochemical processes.
6. Knowledge of electronics, computer programming and numerical methods in the appendix to petrochemistry.
7. Possession of profound newest knowledges in the basic areas of petrochemical specialization (for choice): petrochemistry, technology of chemistry of oil, organic petrochemical synthesis.

II. Understanding

1. Understanding of unity of basic principles of chemistry.
2. Ability to understanding and an establishment of communications between a wide spectrum of the chemical phenomena and the facts, applying these fundamental principles.
3. Creation of theoretical models of technological processes, devices and property of materials and products.
4. Understanding of the principles of work and ability to work at the modern equipment when carrying out scientific research.

Results of training programs

I. Application

1. Ability adequately to apply the methods based on information technology in petrochemistry.
2. Ability to solve a wide spectrum of known problems of a petrochemical science and to undertake the decision of implicit and unresolved problems.
3. Application deep natural-science, mathematical and engineering knowledge for creation of new materials.

4. Construction and modeling for the description and forecasting of the various phenomena, implementation of their qualitative and quantitative analysis.

II. Analysis

1. Ability to use the knowledge received at studying base and elective of disciplines at the petrochemistry course, at decision-making in the basic directions of practical activities.
2. Ability to compare, analyze and interpret the difficult experimental information and to do conclusions to its base.
3. Search, processing, analysis and systematization of scientific and technical information on a research subject, choice of techniques and task cures.

III. The synthesis

1. Ability of planning, realization and the description of serious scientific research, with the subsequent making up and protection of master dissertation
2. Ability to solve a problem of a petrochemical science in a various context and ability to establish connection between problems and basic principles.
3. Ability to planning and realization opened (open-ended) scientific researches or projects.

IV. Evaluation

1. Ability to state the proofs and to do exhaustive written and oral presentations
2. Assessment of prospect and possibility of use of achievements of scientific and technical progress in innovative development of branch, the offer of ways of their realization.
3. Assessment of efficiency and introduction in production new technologies.
4. Ability and readiness to count and estimate conditions and consequences (including economic) made organizational and administrative decisions
5. Assessment of economic efficiency of technological processes, their ecological safety and technological hazards at introduction of new technologies.

The following **curriculum** is presented:

B Characteristics of the PhD Programme

Title of modules	Course code	**Title of courses**	Credit	**Unit (ECTS)**	**Lec/prac /Lab.**	**Sem.**
1. State Compulsory Module (8 credits)	OSPPNGU7201	Organic syntheses based on refined petroleum products, gas and coal	3	5	2+1+0	1
2. Elective Modules of Professional Specialization (15 credits)	STGPN 7202	Modern technologies of deep processing of oil, gas and coal	3	5	2+1+0	1
	PKN 7203	Industrial Catalysis in oil refining	3	5	2+1+0	1
	STPPKNN 7204	Modern technologies of production of industrial catalysts for the petrochemical and oil refining	3	5	2+1+0	2
	SMIK 7205	Modern methods of investigation of catalysts	3	5	2+1+0	2
	IPGK 7206	Innovative approaches in homogeneous catalysis	3	5	2+1+0	2
3.Modules of Individual Educational Paths (18 credits)	PKIPNP 8301	The problems of integrated use of the products of petrochemical production	3	5	2+1+0	3
	SPNS 8302	Modern principles of oil organic synthesis	3	5	2+1+0	3
	USSSN 8303	Utilization of sulfur and organic sulfur compounds of oil	3	5	2+1+0	3
	NTPNG 8304	Non-traditional technology oil and gas processing	3	5	2+1+0	4
	NNN 8305	Nanomaterials and nanotechnol-ogy in petrochemicals	3	5	2+1+0	4
	HTTPPTSMSP 8306	Chemistry and Technology of the small production of additives for fuels and lubricants and special products	3	5	2+1+0	4
4. Additional Types of Training (34 credits**)**	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**		**Credit**	**Unit (ECTS)**	**Sem.**	
	NIRM I	Research Seminar I	2	3	1	
	NIRM II	Research Seminar II	2(+1,5)	6	2	
	NIRM III	Research Seminar III	2	3	3	
	NIRM IV	Research Seminar IV	2(+1,5 +3)	11	4	
	NIRM V	Research Seminar V	2	3	5	
	NIRM VI	Research Seminar VI	2(+4+3)	15	6	
	Professional Practice					
	PP	Pedagogical Practice	3	5	3	
	IP	Research practice	3 (2+1)	10	2,4	
5. Final Attes-	**Final Attestation**					

tation (5 credits **)**					
	KE	Complex Examination	1	2	6
	ZD	Dissertation Fullfilment and Defence	4	7	6
TOTAL			75 credits		

For the PhD-Programme in Chemistry the self-evaluation report states the following **intended learning outcomes**:

Knowledge
1.Know the main modern problems of applied and fundamental chemistry
2.Know the general laws of the chemical behavior of an amino, hydroxy, oxoacids, proteins, nucleic acids, carbohydrates, lipids and vitamins in the body, improving the methods of investigation of their structure and metabolism
3.Know applied aspects of the chemistry of surfaces and how to use them to solve theoretical and practical problems in all fields of chemistry.
4.Know the modern tendencies of polymeric materials development; structure features of polymers; peculiarities of the physical and mechanical properties of polymers and polymer composites; modern production methods of polymeric materials and polymer nanocomposites.
5.Know the features of the behavior of radioactive isotopes in heterogeneous systems; the component of natural background radiation; know the mechanism of the influence of radiation on living organisms; know the behavior of radioactive isotopes in the environment.
6.Modern catalytic and non-catalytic production based on the processing of petroleum products.
7.Know the classification, structure of nanoparticles, morphological and physico-chemical properties of carbon nanotubes, fullerenes, grafens and hydrophobic carbon black.
8.Determine the object and methods of study
9.On the basis of this overview, each graduate school should synthesize chemical compounds using standard synthetic and purification procedures.

Understanding
1.PhD student be able to understand the research scientific information about courses and subjects, which do not belong to the field of their primary research work.
2. The level of knowledge and understanding exhibited by the student will allow him to embark upon the study within various approved educational programs.
3. Student could understand characteristics of the formation the PhD program of the chair of chemistry of organic and inorganic matters, natural compounds and polymers.
4.Classify the resulting information for planning and forecasting.
5.Discuss the correctness of the valuation of knowledge.

Application
1. Develop proficiency in the critical analysis of scientific research problems.
2. Choose forms, methods and means of chemistry technology information.
3. Apply the modern information technology in chemistry.
4. Make conclusions and formulate expert advice on complex issues in specific fields of chemistry and clearly express their ideas and opinions, both for specialists and for non-experts in the field of chemistry.
5. Interpret the theoretical and practical aspects of the basic chemistry.
6. Use tables and graphs for analysis of research work.

Analysis
1. Evaluate the results of the Advanced statistical methods
2. Calculate generalized indicators and statistical values
3. Analyze the data from other stations, combining different datasets
4. Develop a plan for continued professional growth in the field of chemistry.
5. Understand distinction between scientific tools used in accounting
6. Differentiate situations and approaches to solving problems

Synthesis
1. To know the principles of creativity, the ability to generate new and fruitful ideas, plans, projects, developments, the ability to implement them in practice.
2. Organize and conduct monitoring of problem-solving skills to chemical laboratory problems
3. Demonstrate scientific knowledge, acquired in a systematic way, and reflecting the current state of the corresponding branch of chemical science or field of professional activity.
4. Create a strategy for the analysis of chemical concepts to tasks, such as the analysis and synthesis of chemical compounds and samples and to develop approaches and techniques for the solution of problems
5. Formulate goals and objectives for chemistry
6. Propose possible scientific methods of learning to achieve goals

Evaluation
1. Determine the results of work on account of the process and laboratory equipment
2. Develop a quantitative and qualitative analyses using prescribed laboratory procedures
3. Conceptualize, develop and implement projects that consider the creation and production of new knowledge or practical applications on topical areas of the relevant scientific field of chemistry.
4. The ability to structure the existing and newly acquired knowledge in their chosen field of fundamental and applied chemistry.
5.To express results of researches in a clear form, be able independently prepare material for submission of application for patent and write analytical reports, reviews, scientific articles.
6.Evaluate the significance of the taken results

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**ECTS/ hours**	**Lec/prac /Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module (3 credits)	TPFH 7201	**Theory and problems of physical chemistry**	3	3/135	1+2+0	1
2. Elective Module of Professional Specialization 1 Specialized Compulsory Module 1 (5 credits)	**Actual problems of radiation chemistry (6D060601 - Fundamental Chemistry)**					
	APRE 7202	Actual problems of radiating ecology	3	3/135	1+2+0	1
	PRBZ 7203	Behavior of radionuclides in biosphere of the Earth	2	2/90	1+1+0	1
	Modern tendency of science about polyfunctional compounds developing (6D060602 Applied Chemistry)					
	SANP 7202	Modern aspects of development of a science about polymers	3	3/135	1+2+0	1
	HBAV 7203	Chemistry of biological active substances	2	2/90	1+1+0	1
Additional Types of Training	**Doctoral Student's Research Work and Fulfillment of Dissertation**					
	NIRD I	Research Seminar I	1	1/45		1
Semester 2						
Elective Module of Professional Specialization 2 Specialized Compulsory Module 1 (5 credits)	**Actual problems of chemical kinetics, catalysis and oil chemistry (6D060601 - Fundamental Chemistry)**					
	PAHKSR 7204	Applied aspects chemical kinetics of difficult reactions	3	3/135	1+2+0	2
	SPKN 7205	Modern problems of a catalysis and oil chemistry	2	2/90	1+1+0	2
	Modern problems of analytical and colloid chemistry (6D060602 Applied Chemistry)					
	SPKH 7204	Modern problems of colloid chemistry	3	3/135	1+2+0	2
	SPAH 7205	Modern problems of analytical chemistry	2	2/90	1+1+0	2
Elective Module of Professional Specialization 3 Specialized Compulsory Module 1 (5 credits)	**Modern problems of chemical physics (6D060601 - Fundamental Chemistry)**					
	PAHKSR 7204	Physics and chemistry of carbon materials	3	3/135	1+2+0	2
	SPKN 7205	Modern problems of chemical physics	2	2/90	1+1+0	2
	Physico-chemistry of surface and polymeric materials (6D060602 Applied Chemistry)					
	PAHP 7206	Applied aspects of surface chemistry	3	3/135	1+2+0	2
	SPPM 7207	Modern problems of polymeric material science	2	2/90	1+1+0	2
Additional Types of Train-	**Doctoral Student's Research Work and Fulfillment of Dissertation**					
	NIRD II	Research Seminar II	1(+3 +4)	8/360		2

ing	**Professional Practice**					
	IP	Research practice	3(2+1)	3/135		2
Semester 3						
Name of modules	Discipline code	**Title of courses**	Credit	**ECTS/ hours**	**Lec/prac/Lab.**	**Sem.**
3. Module of Individual Educational Path 1 MIOT 1 (6 credits).	**Individual education trajectory 1. IET 1. Physical chemistry and catalysis Module 1 Modern tendency of physical chemistry and catalysis developing (6D060601 - Fundamental Chemistry)**					
	TPAFH 8301	Theoretical and applied aspects of physical chemistry	3	3/135	1+2+0	3
	NAKPTPUS 8302	New aspects of catalytic processes in technology of processing of hydrocarbonic raw materials	3	3/135	1+2+0	3
	Individual education trajectory 2. IET 2. Nanochemistry and anorganical chemistry Module 2 Actual problems of ecology (6D060601 - Fundamental Chemistry)					
	SAZH 8301	Modern aspects of green chemistry	3	3/135	1+2+0	3
	TPOKPV 8302	Theory and practice of an assessment of quality of natural waters	3	3/135	1+2+0	3
	Individual education trajectory 1. IET 1. Analytical and colloidal Chemistry Module 3 Applied aspects of analytical chemistry (6D060602 Applied Chemistry)					
	SFHMIVM 8301	Modern physico-chemical methods of substances and materials investigation	3	3/135	1+2+0	3
	OETHS 8302	Basis of ecological toxicology of chemical compounds	3	3/135	1+2+0	3
	Individual education trajectory 2. IET 2. Chemistry of medicinal substances and polymers Module 4 Innovational methods of new medicinal systems obtaining (6D060602 Applied Chemistry)					
	IGF 8301	The selected heads of pharmachemistry	3	3/135	1+2+0	3
	SASLPIIN 8302	Modern aspects of drug design using innovative nanotechnology	3	3/135	1+2+0	3
Module of Individual Educational Path 2 MIOT 2. (6 credits).	**Individual education trajectory 1 IET 1. Physical chemistry and catalysis Module 5 Calculation methods of physical chemistry (6D060601 - Fundamental Chemistry)**					
	CTMN 8303	Statistical theory and methodology in science	3	3/135	1+2+0	3
	Individual education trajectory 2. IET 2. Nanochemistry and anorganical chemistry Module 6 Bases of nanotechnologies (6D060601 - Fundamental Chemistry)					
	FON 8303	Fundamental bases of nanotechnologies	3	3/135	1+2+0	3
	Individual education trajectory 1 IET 1. Analytical and colloidal Chemistry Module 7 Problems and electrochemistry and electroanalysis (6D060602 Applied Chemistry)					
	EUDS 8303	Electrochemistry and stability of dispersion system	3	3/135	1+2+0	3
	Individual education trajectory 2. IET 2. Chemistry of medicinal substances and polymers Module 8 Composite materials (6D060602 Applied Chemistry)					
	SMIP	Modern methods of research of polymers	3	3/135	1+2+	3

<table>
<tr><td></td><td>8303</td><td colspan="2"></td><td></td><td></td><td>0</td><td></td></tr>
<tr><td rowspan="4">Additional Types of Training</td><td colspan="7">Doctoral Student's Research Work and Fulfillment of Dissertation</td></tr>
<tr><td>NIRD III</td><td colspan="2">Research Seminar III</td><td>1</td><td>1/45</td><td></td><td>3</td></tr>
<tr><td colspan="7">Professional Practice</td></tr>
<tr><td>PP</td><td colspan="2">Pedagogical Practice</td><td>3</td><td>3/135</td><td></td><td>3</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="11"></td><td colspan="7">4 Modules for Individual Educational Trajectories (IET 1)</td></tr>
<tr><td colspan="2">MIOT 1</td><td colspan="2">MIOT 2</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Modern tendency of physical chemistry and catalysis developing</td><td>Applied aspects of analytical chemistry</td><td>Calculation methods of physical chemistry</td><td>Problems and electrochemistry and electroanalysis</td></tr>
<tr><td>6D060601 - Fundamental Chemistry</td><td>6D060602 Applied Chemistry)</td><td>6D060601 - Fundamental Chemistry</td><td>6D060602 Applied Chemistry)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>TPAFH 8301 Theoretical and applied aspects of physical chemistry</td><td>SFHMIVM 8301 Modern physico-chemical methods of substances and materials investigation</td><td rowspan="2">CTMN 8303 Statistical theory and methodology in science</td><td rowspan="2">EUDS 8303 Electrochemistry and stability of dispersion system</td><td>3</td><td>3/135</td><td>1+2+0</td><td>3</td></tr>
<tr><td>NAKPTPUS 8302 New aspects of catalytic processes in technology of processing of hydrocarbonic raw materials</td><td>OETHS 8302 Basis of ecological toxicology of chemical compounds</td><td>3</td><td>3/135</td><td>1+2+0</td><td>3</td></tr>
<tr><td colspan="7">4 Modules for Individual Educational Trajectories (IET 2)</td></tr>
<tr><td colspan="2">MIOT 1</td><td colspan="2">MIOT 2</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Actual problems of ecology</td><td>Innovational methods of new medicinal systems obtaining</td><td>Bases of nanotechnologies</td><td>Composite materials</td><td></td><td></td><td></td><td></td></tr>
<tr><td>6D060601 - Fundamental Chemistry</td><td>6D060602 Applied Chemistry)</td><td>6D060601 - Fundamental Chemistry</td><td>6D060602 Applied Chemistry)</td><td></td><td></td><td></td><td></td></tr>
</table>

	SAZH 8301 Modern aspects of green chemistry	IGF 8301 The selected heads of pharmachemistry	FON 8303 Fundamental bases of nanotechnologies	SMIP 8303 Modern methods of research of polymers	3	3/135	1+2+0	3
	TPOKPV 8302 Theory and practice of an assessment of quality of natural waters	SASLPIIN 8302 Modern aspects of drug design using innovative nanotechnology			3	3/135	1+2+0	3
Semester 4								
Name of modules	Discipline code	**Title of courses**			Credit	**ECTS / hours**	**Lec/prac/Lab.**	**Sem.**
Module of Individual Educational Path 2 MIOT 2	**Individual education trajectory 1 IET 1. Physical chemistry and catalysis Module 5 Calculation methods of physical chemistry (6D060601 - Fundamental Chemistry)**							
	RMHT 8304	Calculation methods of chemical thermodynamics			3	3/135	1+2+0	4
	Individual education trajectory 2. IET 2. Nanochemistry and anorganical chemistry Module 6 Bases of nanotechnologies (6D060601 - Fundamental Chemistry)							
	MIDNN 8304	Methods of research and diagnostics of nanoobjects and nanosystems			3	3/135	1+2+0	4
	Individual education trajectory 1 IET 1. Analytical and colloidal Chemistry Module 7 Problems and electrochemistry and electroanalysis (6D060602 Applied Chemistry)							
	SEME 8304	Modern electrode materials in electroanalysis			3	3/135	1+2+0	3
	Individual education trajectory 2. IET 2. Chemistry of medicinal substances and polymers Module 8 Composite materials (6D060602 Applied Chemistry)							
	PKKMO 8304	Polymeric complexes and composite materials on their basis			3	3/135	1+2+0	3
Module of Individual Educational Path 3 MIOT 3 (6 credits)	**Individual education trajectory 1. IET 1. Physical chemistry and catalysis Module 9 Processing of firm hydrocarbonic raw materials (6D060601 - Fundamental Chemistry)**							
	GPJF 8305	Hydrogenation processes in a liquid phase			3	3/135	1+2+0	4
	TPPTUS 8306	Theory and practice of processing of firm hydrocarbonic raw materials			3	3/135	1+2+0	4
	Individual education trajectory 2. IET 2. Nanochemistry and anorganical chemistry Module 10 Redox processes (6D060601 - Fundamental Chemistry)							
	PAOVP 8305	Applied aspects of redox processes			3	3/135	1+2+0	4
	ESVSHMCK 8306	Electrochemical methods for the removing of chalcogenide compounds from Kazakhstan raw minerals			3	3/135	1+2+0	4

	Individual education trajectory 1. IET 1. Analytical and colloidal Chemistry Module 11 Colloid chemistry of biosystems (6D060602 Applied Chemistry)					
	KHBD 8305	Colloid chemistry of biological dispersions	3	3/135	1+2+0	4
	TPHE 8306	Theory and practice of chemical enzimology	3	3/135	1+2+0	4
	Individual education trajectory 2. IET 2. Chemistry of medicinal substances and polymers Module 12 Chemistry of biomedicinal polymers (6D060602 Applied Chemistry)					
	SPPBN 8305	Modern problems of biomedicinal polymers	3	3/135	1+2+0	4
	NOSPLS 8306	Scientific bases of creation of the prolonged medicinal systems	3	3/135	1+2+0	4
Additional Types of Training	**Doctoral Student's Research Work and Fulfillment of Dissertation**					
	NIRD IV	Research Seminar IV	1(+3+4)	8/360		4
	Professional Practice					
	IP	Research practice	3(2+1)	3/135		4

	4 Modules for Individual Educational Trajectories **(IET 1)**						
	MIOT 2		**MIOT 3**				
	Calculation methods of physical chemistry	**Problems and electrochemistry and electroanalysis**	**Processing of firm hydrocarbonic raw materials**	**Colloid chemistry of biosystems**			
	6D060601 - Fundamental Chemistry	**6D060602 Applied Chemistry)**	**6D060601 - Fundamental Chemistry**	**6D060602 Applied Chemistry)**			
	RMHT 8304 Calculation methods of chemical thermodynamics	SEME 8304 Modern electrode materials in electroanalysis	HTOMK 8405 Chemistry and Technology of the organic-minerals compositions	KHBD 8305 Colloid chemistry of biological dispersions	3	3/135	1+2+0	4
			PSPE 8406 Polycomplexes synthetic polyelectrolytes	TPHE 8306 Theory and practice of chemical enzimology	3	3/135	1+2+0	4
	4 Modules for Individual Educational Trajectories (IET 2)						
	MIOT 2		**MIOT 3**				

	Bases of nanotech-nologies	**Composite materials**	**Redox processes**	**Chemistry of biomedicinal polymers**				
	6D060601 - Fundamental Chemistry	**6D060602 Applied Chemistry)**	**6D060601 - Fundamental Chemistry**	**6D060602 Applied Chemistry)**				
	MIDNN 8304 Methods of research and diagnostics of nanoobjects and nanosystems	PKKMO 8304 Polymeric complexes and composite materials on their basis	PAOVP 8305 Applied aspects of redox processes	SPPBN 8305 Modern problems of biomedicinal polymers	3	3/135	1+2+0	4
			ESVSHMCK 8306 Electrochemical methods for the removing of chalcogenide compounds from Kazakhstan raw minerals	NOSPLS 8306 Scientific bases of creation of the prolonged medicinal systems	3	3/135	1+2+0	4
Semester 5								
Additional Types of Training	**Doctoral Student's Research Work and Fulfillment of Dissertation**							
	NIRD V	Research Seminar V			1	1/45		5
Semester 6								
Additional Types of Training	**Doctoral Student's Research Work and Fulfillment of Dissertation**							
	NIRD VI	Research Seminar VI			1(+8)	9/405		6
Final Certification (5 credits)	**Final Certification**							
	KE	Complex Examination			1	1,7/45		6
	ZD	Dissertation Fulfillment and Defense			4	6,7/180		6

C Peer Report for the ASIIN Certificate

1. Formal Information

Criterion 1.1 Formal Information

Evidence:

- Self Evaluation Report
- Auxiliary document: “University-wide Academic Policies and Procedures of al-Farabi Kazakh National University”

Preliminary assessment and analysis of the peers:
The formal specifications of the programmes are presented in the Self Evaluation Report. The audit team confirmed that the names of the PhD-programmes reflect their contents properly.

The formal structure of the programmes is in line with the state requirements for PhD-programmes in Kazakhstan. Upon completion, students are awarded with a PhD-degree. The programme requires full-time involvement of students and extends over a period of three years. Not all time spent within these three years is credited. Participants are awarded with 75 Kazakh credits, which are reported to equal 125 credit-points ECTS. These credits only refer to the subsidiary modules provided by the curriculum. The audit team understands perfectly that the individual independent research work of participants, which is ought to be the central part of the programme, cannot be credited with ECTS.

Concerning student admission, the peers found the number of intakes per year for every PhD degree programme presented to be reasonable and in the line of the criteria.

The audit team considered the formal specifications of the programme to be adequately defined. The formal information regarding the degree programmes is published on the websites of al-Farabi Kazakh National University and in its “Academic Policy” (which is also available on the websites of the university).

Criterion 1.2 Legal relationship: mutual rights and duties

Evidence:

- Discussions with faculty members responsible for programme implementation
- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"

Preliminary assessment and analysis of the peers:
The legal relationship between PhD students and the al-Farabi Kazakh National University is documented in the Academic Policy of the al-Farabi Kazakh National University. The Academic Policy defining all rules and regulations is accessible to all interested parties.

The Academic Policy defines the rules of admission. The allocation of grants is conducted on a very competitive base among all Kazakh Higher Education Institutions. Furthermore, it is determined in the Academic Policy that each PhD student has one local adviser and one international adviser; the local research adviser must be a full-time professor of al-Farabi Kazakh National University. An international research adviser must be a full-time professor of international universities or research centers. The PhD Students are required to conduct parts of the research at the institution of the international research advisor and they must produce 7 academic pieces of works. In addition, PhD students have to fulfill teaching obligations.

The auditors concluded that the rights and duties applicable to PhD students at the al-Farabi University were clearly defined.

Final assessment of the peers after the comment of the Provider regarding criterion 1:

The peers confirmed their initial judgment.

2. Courses/Modules: Content, Policy and Implementation

Criterion 2.1 Learning outcomes

Evidence:

- Self Evaluation Report
- Discussions with the responsible members of university management
- Discussions with staff responsible for managing the study programmes
- Defined programme objectives and learning outcomes in the Self Evaluation Report

Preliminary assessment and analysis of the peers:

Kazakhstan is introducing the PhD-cycle following the implementation of the three-cycled Bologna structure. This means that PhD-programmes are still in a nascent stage. One major stakeholder defining the overall structure of the study programmes in general and particularly of the PhD-programmes is the Kazakh Ministry for Education and Science. This counts especially for the duration of PhD-programmes and the number of courses within these programmes.

Both audit-team and faculty-staff agree that the most important learning outcome of the programme is the competence of PhD-graduates to conduct independent scientific research competitive at an international level. As suitable generic assessment criteria, the highest level 8 of the European Qualifications Framework (EQF) is applied. This level defines that students acquire *knowledge at the most advanced frontier of a field of work or study and at the interface between fields*, achieve *the most advanced and specialized skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice.* They are intended to be able to *demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research*. This means that in terms of learning outcomes, the programmes cannot be considered like a study programme with a thoroughly defined content.

The peers came to the conclusion that all degree programmes in question do roughly fulfill the requirements of the level 8 of the European Qualifications Framework. However, the peers widely discussed the general concept of the programmes and its implication for the intended learning outcomes and their achievement in practice. The programme coordinators of the HEI agreed with the peers that all of the faculty's PhD programmes are somehow weak in the theoretical methods and foundations of research work. The courses in the degree programmes stress more the transfer of theoretical knowledge onto a practical level. The programme coordinators stated that they are fully aware of the said problem and working on an improvement. They monitor the procedures and curricula of other leading universities in order to learn from their example how to establish a qualitative PhD degree programme. The programme coordinators also agreed with the peers that a three year duration of the programmes in principle is too short a time to implement all aims and achieve all learning outcomes which are intended by the programmes' outlines. This view was also confirmed by the students, who expressed their wishes for a much greater share of practical laboratory research work in comparison to theoretical courses. Alumni of the programmes as well as the teaching staff shared this conviction. In summary, the peers recommended the introduction of a model of one year of theoretical

courses at the beginning of the programmes, followed by three years of solely practical research work in the laboratory. Such a model would comply to international standards and give the students the opportunity to develop the research skills needed in an international scientific environment. The programme coordinators pointed out that the given structure of the PhD programmes rests on the Kazakh Ministry of Education's regulations and prescriptions and cannot be altered on a short notice. The peers underpinned the signal importance of such a reformed structure for the success of the PhD degree programmes in question. They encouraged the HEI representatives and the programme coordinators to bargain with the ministry for the implementation of such changes in order to give the students the opportunity to fully mature their research skills and to open the doors of international research facilities to the programmes' graduates.

Criterion 2.2 Prospects of the labour market and practical orientation

Evidence:

- Discussion with responsible staff from the faculty
- List of companies functioning as possible employers

Preliminary assessment and analysis of the peers:

The number of PhD students who were accepted in the last years is small. In the degree programme Technical Chemistry of Inorganic Substances, five students have been admitted in 2012; in Nanomaterials and Nanotechnology one student has been accepted in 2012. The other programmes range within these figures. Consequently, the number of graduates is limited and those who graduated were employed either by the university itself, by other universities of Kazakhstan or by external research institutes. In the Self Assessment Reports of all the PhD programmes lists of employers were provided like the Al-Farabi KazNU in Almaty or the Scientific Research Institute of Combustion Problems in Almaty. Also private companies were mentioned as employers like Tengiz Chevroil, JSC Chemfarm or the Uranium mine in Karatau; there were also some international research institutions mentioned, like the Rostock University or the Kairo University. The auditors appreciated that also private companies showed interest in graduates with these competences and comprehended that there is a demand for graduates with the intended learning outcomes.

The auditors understood that the PhD candidates have to conduct research internships in research projects of their professors in Kazakhstan and abroad and most of them teach undergraduate students which gives them an opportunity for pedagogical practice. The panel deemed this to be positive for their further teaching activities. The panel concluded

that an acceptable relation to the practical, professional side of the programme had been integrated into the course.

Criterion 2.3 Admission requirements

Evidence:

- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Discussion with responsible staff from the faculty

Preliminary assessment and analysis of the peers:

The application to an announced PhD-position is open to interested masters´ graduates from whole Kazakhstan and abroad. Places in the PhD programmes are very limited.

Master degree graduates who apply for the PhD programmes have to pass an English test at least at the level of TOEFL 1. A maximum of 100 admission points is given for the English proficiency test and likewise a maximum of 100 points for the Master's degree mark. Starting from a combined 150 points in the admission procedure, an applicant is enrolled into the PhD programme. Afterwards, the professor can choose from the successful candidates the ones they want to accept as personal students. But one professor is only entitled to accept a maximum of three PhD students at a time.

Altogether, the selection procedure conducted for PhD-students admission clearly "ensure[s] that all admitted learners fulfill the necessary requirements" as stated explicitly in the criteria. The overall procedure is explained in the "University-wide policy", which is accessible on the university´s website. The audit team therefore confirmed that the respective criteria are perfectly met.

Criterion 2.4 Contents

Evidence:

- Self Evaluation Report
- Module descriptions

Preliminary assessment and analysis of the peers:

As mentioned before, the overall structure of the programme depends on state requirements, but the faculty can define some details autonomously. In the discussions it was clarified that the core of the programme consists of the individual independent research work conducted by PhD-students. This is supplemented by theoretical and methodological courses, which are partly elective, partly mandatory. Upon entrance into the PhD-

programme, every student creates his own trajectory of studies in cooperation with his supervisor within the given framework and programme structure.

These courses take place even with three students or less. Staff responsible for programme management could convincingly reason, that courses in this setting have a seminary character.

As already stated above, the peers voiced their opinion that the curricula in the current state are too heavily weighed on the part of theoretical courses. Although the peers stressed the importance of a sound theoretical-methodological foundation of the programmes, they thought the percentage of courses in relation to the lab work too extensive. The students informed the peers about their impression that almost half of the time spent in the PhD programmes was devoted to course work, which they found far too much for building up an individual research profile. The programme representatives corrected the students' view in so far, as they pointed out that the first and second year of the programmes have greater portions of course work because the last year is completely devoted to research activity. Nevertheless, the peers deemed the amount of laboratory work in the degree programmes too limited, especially with view to international programmes of four years duration. The peers therefore recommended to the HEI to do more fundamental research in the degree programmes.

The peers could not support the amount of mandatory courses in the PhD-programme. To develop independent research skills and individual focal points of study, the peers found it very important to have a wide variety of elective courses where the students can choose from according to the needs of their personal situation and state of studies. The peers recommended therefore to the HEI to introduce a pool of elective courses, including soft skills. The number of mandatory courses should be recuced to a minimum.

With these clarifications, the audit team confirmed that the respective criteria for programme content are fulfilled. It supports the faculty in any means possible to further sharpen the structure of the programme towards more research orientation.

Final assessment of the peers after the comment of the Provider regarding criterion 2:

The peers welcomed the renewed statement of the HEI to principally support the idea of a four year model of PhD studies with one year of theoretical courses at the beginning and three years of practical research work afterwards. The peers understood that the decision to introduce such a model lies with the Kazakh Ministry of Education, and cannot be accomplished by the HEI alone. Still, the peers considered it worth the effort to try the introduction of such a four year model. The peers strongly supported the intention of the HEI to start talks with the Ministry of Education about the introduction of this model.

3. Courses/Modules: Structures, Methods and Implementation

Criterion 3.1 Structure

Evidence:

- Self Evaluation Report
- Module descriptions

Preliminary assessment and analysis of the peers:
All PhD programmes in question last three years in full-time-provision. The research work of PhD-students is planned to start from the beginning (usually in continuation of research work done at master´s level). The first two years are devoted to preparative and empirical tasks and a number of courses on fundamentals. The first two years are more heavily weighted on coursework. As the students stated towards the peers, up to 50 % of the time in these two years consists of seminars. The third year is dedicated to the completion of the dissertation. This year is devoted mostly to individual laboratory research work. The workload for the whole programme is calculated with 125 ECTS. These credit points comprise in the first place the coursework of the first two years of the PhD studies, since the individual research projects are hard to calculate in credits because of individual reasons.

The peers stressed the importance of the individual research work for the success of the PhD programmes. They pointed out that – viewed against the background of the coursework during the first two years of the programmes – the amount of time devoted to individual laboratory research seems to be too limited. This view was also confirmed by the students. Furthermore the peers found it difficult for the students that the seminars are distributed over two years of the programmes, thereby reducing the time available solely for research to the last year of the programmes. In this way it is hard for the students to concentrate on the core of their task – the individual research. The peers recommended to the HEI to concentrate the courses and the teaching in the first year so that students can focus on their research work for the remaining time of theirs studies. For the long run the peers recommended to the HEI to introduce a 1+3 year model for the PhD studies according to international standards to give more time for the research projects of the students. This would mean one year of courses at the beginning of the programme plus three years of laboratory research afterwards. Such a model would improve the competitiveness of the graduates on an international level.

With the abovementioned constrains the audit team considered the structure of the programme to be clearly defined and the criteria to be met.

Criterion 3.2 Workload

Evidence:

- Module descriptions
- Discussion with responsible staff from the faculty

Preliminary assessment and analysis of the peers:
The University-wide Academic Policy states that the average student workload of PhD degree students must not exceed 57 hours per week; one hour auditorium workload must be followed by 7 hours self study workload. Even though this workload was considered very high by the auditors, the students confirmed that they can cope with their workload and think it is feasible and acceptable.

The Self Assessment Reports explained the work load per semester. The peers understood that the workload was fairly evenly balanced over the semesters. This was also confirmed by the students. The auditors reckoned that the estimated time budgets are realistic enough to enable learners to reach the learning outcomes of the module within the scheduled time and at the level aimed at.

Criterion 3.3 Teaching methodology

Evidence:

- Module descriptions
- Discussion with responsible staff from the faculty

Preliminary assessment and analysis of the peers:
At the first glance, just having the module descriptions at hand, the course content of the PhD programmes seemed to prolong the education at master´s level. This could be clarified in the discussion with faculty staff responsible for programme coordination and teaching staff. The faculty could credibly reason, that the courses held specifically for the small number of PhD-students are in general conducted in a rather seminary and problem-oriented style and that they are specifically adapted to the needs of the individual research work of PhD-students.

For this reason, the audit team considers the criteria to be sufficiently met.

Criterion 3.4 Support and assistance

Evidence:

- Discussion with responsible staff from the faculty

Preliminary assessment and analysis of the peers:
In view of the audit team, there is a strong approach for support and advice implemented in the PhD programmes. Each PhD student has two advisors, one from the faculty and one scientist from abroad. Upon entrance of the programme, students´ are obliged to find an external supervisor for their thesis by e.g. reviewing international conferences and research publications. By criteria for the appointment of supervisors, they have to be a doctor of science with sufficient publication volume and impact within the realm of the PhD-students research work. The relationship to the external supervisor is structured by contracts. This is considered to be a good solution by the audit team. The relationship to the supervisor from the faculty is described by students as daily presence and communication.

The auditors learned from the students that these feel sometimes unsure about the correct proceedings for the application of research funds, possibilities of international cooperation or exchange or other matters of academic work on an international basis. The peers therefore recommended to the HEI to introduce coaching of the students for an academic career.

The means taken by the faculty for supporting and advising students are completely appropriate in the eyes of the peers.

Final assessment of the peers after the comment of the Provider regarding criterion 3:

The peers welcomed the willingness of the HEI to concentrate the distribution of theoretical courses at the beginning of the curriculum. The peers stressed their intention that the methodological foundations of the PhD programmes in the theoretical courses could be further strengthened while at the same time concentrating the courses in the first year of the curricula. The proportion of theoretical courses in comparison to the research work should not be extended, but the focus of the theoretical courses should be laid more precisely on the theoretical and methodological foundations for the research work.

Otherwise the peers confirmed their judgment concerning the criterion in question.

4. Examination: System, Policy and Forms

Criterion 4 Exams: System, policy and forms

Evidence:

- Discussion with responsible staff from the faculty
- Discussion with the students

Preliminary assessment and analysis of the peers:
All modules must be passed with examinations. The module descriptions explain the kind of examination that has to be passed. A timetable for the examinations that need to be taken is made known to the PhD-students at the beginning of the semester. According to the students, the sequence of exams was appropriate to have sufficient time to prepare for the exams. In most cases there are interim controls comprising attendance, in-class discussion, problem solving, and testing. Furthermore, there is normally a final exam which contributes 50% to the overall grade of the module. The progress of the PhD students' research work is monitored by periodical reports. The peers expressed their opinion that these written reports are not really necessary to ensure the quality of the programmes. The close contact of the students with their supervisors, the required publications, and the other forms of testing are enough to monitor the students' progress (see also chapter 7.1)

For the modules stated in the module handbook only written examinations are foreseen, oral examinations are not mentioned at all. Even though the auditors acknowledged that oral presentations have to be made at conferences, the panel underlines that oral competences should also be fostered and developed during the PhD programmes and not only at conferences. Hence, it is recommended providing more opportunities to PhD students to orally present a scientific problem of their specialty and to properly explain measures of potential solutions also in English language.

The auditors received a detailed list of all PhD students, an abstract of the current PhD work and the list of publications of the PhD students. Based on this information the auditors could understand the academic and scientific level of the PhD thesis. The auditors could confirm that the research topics of the PhD thesis were appropriate and the scientific approaches selected implied methodological innovation and scientific independence.

The peers learned that each student in the PhD programmes has to produce 7 papers a year as part of the examination system and to monitor their studies' progress. Three of those papers have to be publicized in local academic journals; one paper has to be submitted to and accepted by an international scientific journal; three papers are free to be

publicized according to the student's choice. The number of pages is prescribed by the examination regulations. The auditors found the number of seven papers per year quite high, and not really necessary to monitor the students' progress. The peers stressed the importance of high quality publications in international journals. Therefore, the peers recommended to the HEI to reduce the number of publications in local journals and stress the quality of publications instead.

Final assessment of the peers after the comment of the Provider regarding criterion 4:

The peers considered the HEI's comments about the status of oral examinations. Although the peers could see that written exams may be regarded as highly efficient, they nevertheless hold firm to the importance of oral examination forms for the personal development of the candidates. Therefore, the peers approvingly noted the statement of the HEI that oral examinations are present among the mid-term controls. Nevertheless, since the peers expressed their opinion that the number of reports overall could be reduced, they upheld their recommendation to introduce more oral examinations in comparison to written tests.

5. Resources

Criterion 5.1 Staff

Evidence:

- Staff handbook in the Self Evaluation Report
- Discussion with members of the university management

Preliminary assessment and analysis of the peers:

In the discussion with the peers, the representative of the university management resumed the yet ongoing transformation process of al-Farabi University into a research institution, after being a more educationally oriented university in former times. Concerning scientific staff, this is to be achieved by a results-based management approach, which appears in individual agreements on objectives and individual reporting, taking into account the research performance to 50%, the educational performance to 35% and to 15% the social work of teaching staff in creating a generation with a deep respect to society.

In general, the academic career stages lead from the position of a young researcher to an assistant professor to an associate professor and then to a full professorship with the latter being the only permanent position in the academic career. The appointment to titles is based on requirements set by the Ministry of Education and Science, mostly taking into

account the number of publications and their impact factor. The requirements are elevated towards the next position. Staff recruitment in general is conducted by open calls (e.g. announcements in newspapers) and for new specialities, staff is partly recruited directly from companies, partly from universities. There is also a governmental budget available for the integration of foreign researchers.

There is maximum number of PhD-students fixed stating three PhD-students per supervisor. The quality criteria applied for external supervisors count as well for internal supervisors. This means that supervisors have to be professors, holding a doctor of science and showing adequate research performance in terms of volume and impact. Concerning the present staff engaged in the PhD programme, the audit team had a good overview through the staff handbooks provided in the Self Evaluation Report. The representative of the university management confirmed that the present faculty staff is assured for the provision of the programme in the certification period.

The peers had a close look at the research performance of staff as a prerequisite for research projects of prospective PhD students. In the staff handbooks, publications lists have been provided and the faculty publishes some of its projects on the websites. The faculty also reported to conduct joint projects together with partners e.g. from Europe, and to participate within the framework of TEMPUS. The discussions convinced the audit team that staff from the departments conducting both PhD-programmes has defined research interests and is motivated to strengthen research orientation of their programmes and the respective prerequisites.

The audit team furthermore strongly supports the efforts of al-Farabi Kazakh National University, which is reported to be working close with the ministry, to obtain more autonomy. The present certification is reported to be a part of these efforts.

Criterion 5.2 Institutional setting, funding and equipment

Evidence:

- Discussion with members of the university´s management
- Self Evaluation Reports
- Visits of laboratories

Preliminary assessment and analysis of the peers:

In the discussion, the representative of the university´s management confirmed the future financial stability of both PhD programmes and their sufficient staff resources. This convinced the audit team that sufficient resources are guaranteed for the period of certification.

The Self Evaluation Reports provided detailed lists of the national and international cooperation of the faculty with partners in the industry and in research institutions. The auditors lauded this wide network of contacts as a sound basis for scientific research cooperation and exchange.

Some of the students in the PhD programmes stated towards the peers that their career goal was to found an own enterprise. The peers judged this career option to be an attractive alternative to a scientific career at a university. Furthermore, good contacts between the university or faculty and start-up companies growing from the pool of graduates would provide further opportunities for both faculty and graduates. The peers therefore recommended to the HEI to support start-up ideas to create a creative environment of innovative industries around the faculty.

To review the complete institutional environment for the PhD programmes, the audit team visited research facilities of the university in several locations. The peers were convinced that the laboratory and equipment of the faculty is sufficient to support the PhD degree programmes and to guarantee a well based education.

The audit team confirmed the respective criteria to be fulfilled.

Final assessment of the peers after the comment of the Provider regarding criterion 5:

The peers noticed that the HEI has a business incubator to support start-ups by graduates. The peers supported the efforts taken by the HEI in this direction and recommended to further strengthen the work of the business incubator.

6. Quality Management: Development and Enhancement

Criterion 6.1 Quality assurance & enhancement

Evidence:

- Auxiliary document: “University-wide Academic Policies and Procedures of al-Farabi Kazakh National University”
- Discussion with staff responsible for the PhD programmes

Preliminary assessment and analysis of the peers:

Concerning quality assurance and further enhancement, the representative of the university management explained to have implemented an ISO 9001 approach for management- and administration-oriented issues.

Concerning the academic quality, the organizational setting with two supervisors, one from the faculty and one from abroad, fulfills a function of quality management. Additionally, there is a fixed ratio of three PhD-students maximum per supervisor. Concerning higher organizational instances, the *Vicerector for Academic Issues* is the relevant representative of the university management to consult if deficiencies would be perceived by students with regards to the quality of the PhD-programme.

Due to the small number of students and the very specific modules large scale evaluations like in the other academic programmes do not take place but the students confirmed that the very close relationship to the teachers allows for a direct feedback to the teachers. Moreover, the students indicated that they would turn to the head of the respective chairs directly, the dean, or even the Vice-rector for Academic Issues in case of major deficiencies, which proves that the open-door policy of the university is functioning well. Considering the fact that the PhD-programmes are still in a developmental phase, the audit team considered quality assurance as sufficient when it depends on a very close student-teacher interaction. Nevertheless, a consistent policy with clearly defined aims, methods and responsibilities is not yet existent and should be developed, ensuring a consistent closing of the feedback loops and further strengthening of the stakeholder involvement. It should be well noted that the methodology chosen does not have to be very complex but should be clearly related to the set targets. In addition, the students and other stakeholders should be involved in the quality assurance process more actively.

Criterion 6.2 Instruments, data and methods

Evidence:

- Self Evaluation Report
- Discussions with staff responsible for faculty management

Preliminary assessment and analysis of the peers:

The Self Assessment Reports demonstrated that the university collects relevant data, such as graduate's number, job placement, and also publication activity. For each and every PhD student a detailed profile was conveyed providing information on the Kazakh supervisor and the international supervisor with their track records of research activities and publications. For the PhD candidates themselves, a short description of the thesis and the publications was provided. This proves that all relevant information on the current PhD students is properly recorded and available. The auditors noticed that key information was collected regularly and that the responsible persons are familiar with the key insights.

With regard to the quality assurance instruments in use, students confirmed that they make use of instruments like completing the student's surveying tools, direct feedback to

the teachers or the responsible person for modules for their further development. The panel encouraged further use of the surveying, especially of alumni, since first cohorts graduated and could in the retrospective make better judgments on practical relevance, the adequacy of the academic programme, make some proposals on further development of the modules and also provide additional career mentoring for the younger students. The auditors encouraged the university to further broaden the instruments and methods used.

Final assessment of the peers after the comment of the Provider regarding criterion 6:

The peers considered the comments of the HEI, and confirmed their original judgment concerning the criterion.

7. Documentation & Transparency

Criterion 7.1 Relevant documents

Evidence:

- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Self Evaluation Report of the PhD programmes

Preliminary assessment and analysis of the peers:
The regulations are transparently presented and clearly explained by the "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University" (called here "Academic Policy"). This policy is available in Russian language on the website of al-Farabi-University.

The audit team considered the specific characteristics of the programmes to be adequately defined in the respective documents, especially the Self Assessment Reports and the module handbooks.

However, the peers found the degree of regulation in all PhD programmes too high to allow academic and organizational flexibility. Especially the regulations regarding publications, the number and frequency of written reports, as well as the selection of courses were to strictly regulated in the opinion of the peers. The peers therefore recommended to the HEI to reduce the degree of regulation in the respective areas.

Criterion 7.2 Certificate upon conclusion

Evidence:

- Self Evaluation Report of the PhD-programme

Preliminary assessment and analysis of the peers:

An example of the leaving certificate provided upon conclusion of the programme was not made available to the panel. Such a certificate should contain information on programme's structure, contents and level of the concluded programmes, as well as the learner's individual performance, the calculation of final mark including different weighting regulations for the separate modules.

Therefore the panel requested the submission of such certificate as additional document jointly with the comment of the university on this report. This document is needed for the final assessment of the programme.

Final assessment of the peers after the comment of the Provider regarding criterion 7:

The peers noticed the opinion of the HEI that regulations of the PhD programmes are not too rigid. The peers nevertheless upheld their judgment that the regulations in the three respective areas – publications, reports, course selection – could be reduced to the benefit of the students.

The peers considered the samples of graduation certificates provided by the HEI as additional documents. The peers found that the certificates already provide a good part of the information required, i.e. information on the level and contents of the programmes, the calculation of the final marks,, and the learner's individual performance. However, some vital information is missing, first of all on the structure of the programmes and the institutional background. The peers therefore advise the HEI to make use of the model developed by the European Commission, the Council of Europe and UNESCO/CEPES.

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the provider on the previous chapters of this report:

D 1. Example of the leaving certificate for each programme

E Comment of the Provider (21.10.2014)

The institution provided a detailed statement as well as additional documents on the following issues:

Comments of Al-Farabi Kazakh National University regarding the report of experts on cluster D (PhD programs)

1.Formal Information	
Criterion 1.1 Formal Information	We agree with the comments of experts
Criterion 1.2 Legal relationship: mutual rights and duties	We agree with the comments of experts
2. Courses/Modules: Content, Policy and Implementation	
Criterion 2.1 Learning outcomes	
2.1 a) The programme coordinators of the HEI agreed with the peers that all of the faculty's PhD programmes are somehow weak in the theoretical methods and foundations of research work. The courses in the degree programmes stress more the transfer of theoretical knowledge onto a practical level.	In our view, a PhD program include a sufficient number of theoretical courses. Program developers agree with the comments of the experts on the need to reduce the proportion of theoretical training up to 1 year and increasing the share of practical research to 3 years. It really would help to achieve the requirements of the program to international standards and to improve the quality of doctoral investigations performed. However, it can be probably considered the possibility of increasing the number of theoretical courses (by increasing the duration of the study). Discussion on this recommendations of the experts - on, 2.1 b, 2.1 c), 2.1 d), 2.4 b).
2.1 b) The programme coordinators also agreed with the peers that a three year duration of the programmes in principle is too short a time to implement all aims and achieve all learning outcomes which are	Three-year PhD program is determined by educational standards of the Republic of Kazakhstan. In just a few years of PhD programs existing we have a positive experience in the final theses defending by PhD stu-

intended by the programmes' outlines.	dents at the end of 3 years. At the same time, probably, increase the period of study for the PhD program up to 4 years may has a positive impact on the quality of PhD students training. This recommendation of expert group members will be taken into account in our appeal to the MES regarding changes in PhD students programs.
2.1 c) In summary, the peers recommended the introduction of a model of one year of theoretical courses at the beginning of the programmes, followed by three years of solely practical research work in the laboratory.	This recommendation is directly linked with the recommendations of 2.1 a) and 2.1 b). If the Ministry of Education and Science approved the increase in the duration of PhD program up to 4 years, the model of "one year of theoretical courses + 3 years of practical research in laboratories" can be realized.
2.1 d) The programme coordinators pointed out that the given structure of the PhD programmes rests on the Kazakh Ministry of Education's regulations and prescriptions and cannot be altered on a short notice. The peers underpinned the signal importance of such a reformed structure for the success of the PhD degree programmes in question. They encouraged the HEI representatives and the programme coordinators to bargain with the ministry for the implementation of such changes in order to give the students the opportunity to fully mature their research skills and to open the doors of international research facilities to the programmes' graduates.	This recommendation is directly linked with the recommendations of 2.1 a), 2.1 b) and 2.1 c). This recommendation of expert group members will be taken into account in our appeal to the MES regarding changes in PhD students programs .
Criterion 2.2 Prospects of the labour market and practical orientation	We agree with the comments of experts
Criterion 2.3 Admission requirements	We agree with the comments of experts
Criterion 2.4 Contents	
2.4 a) As already stated above, the peers voiced their opinion that the curricula in the current state are too heavily weighed on the part of theoretical courses. Although the	This recommendation is not entirely consistent with recommendation 2.1 (where the experts pointed out that the theoretical courses are poorly represented in the pro-

peers stressed the importance of a sound theoretical methodological foundation of the programmes, they thought the percentage of courses in relation to the lab work too extensive.	gram).
2.4 b) The students informed the peers about their impression that almost half of the time spent in the PhD programmes was devoted to course work, which they found far too much for building up an individual research profile. The programme representatives corrected the students' view in so far, as they pointed out that the first and second year of the programmes have greater portions of course work because the last year is completely devoted to research activity. Nevertheless, the peers deemed the amount of laboratory work in the degree programmes too limited, especially with view to international programmes of four years duration. ***The peers therefore recommended to the HEI to do more fundamental research in the degree programmes.***	This recommendation is directly linked with the recommendations of 2.1 a), 2.1 b), 2.1 c) and 2.1 d). This recommendation of expert group members will be taken into account in our appeal to the MES regarding changes in PhD students programs .
2.4 c) The peers could not support the amount of mandatory courses in the PhD-programme. To develop independent research skills and individual focal points of study, the peers found it very important to have a wide variety of elective courses where the students can choose from according to the needs of their personal situation and state of studies. The peers recommended therefore to the HEI to introduce a pool of elective courses, including soft skills. The number of mandatory courses should be recuced to a minimum.	The number and names of the compulsory courses are determined by educational standards of the Republic of Kazakhstan for each specific PhD program. In fact, all PhD programs have only one elective discipline, all the others are elective disciplines (Elective Module of Professional Specialization , Module of Individual Educational Path). Program developers agree with the necessity to introduce courses focused on the developing soft skills, presentation skills, etc. (can be in the form of electives). Resolving this issue is not a big problem and is within the competence of the university.
3. Courses/Modules: Structures, Methods and Implementation	
Criterion 3.1 Structure	
3.1 a) The peers stressed the importance of the individual research work for the success of the PhD programmes. They pointed out	This recommendation is related to the increase in the duration of PhD programs up to 4 years. Experts' recommendation will be

that – viewed against the background of the coursework during the first two years of the programmes – the amount of time devoted to individual laboratory research seems to be too limited. This view was also confirmed by the students.	taken into account in our appeal to the MES regarding changes in the conditions of PhD programs (in particular, to increase the duration of the PhD program).
3.1 b) Furthermore the peers found it difficult for the students that the seminars are distributed over two years of the programmes, thereby reducing the time available solely for research to the last year of the programmes. In this way it is hard for the students to concentrate on the core of their task – the individual research. The peers recommended to the HEI to concentrate the courses and the teaching in the first year so that students can focus on their research work for the remaining time of theirs studies.	Implementing this recommendation will be possible by reducing the number of credits for theoretical studies (at the moment). At the same time, several recommendations of the expert group members aim to increase the proportion of theoretical courses (recommendations 2.1 a) and 2.1 c)). A compromise - an increase in the duration of PhD programs up to 4 years. Experts' recommendation will be taken into account in our appeal to the MES regarding changes in the conditions of PhD programs (in particular, to increase the duration of the PhD program).
3.1 e) For the long run the peers recommended to the HEI to introduce a 1+3 year model for the PhD studies according to international standards to give more time for the research projects of the students. This would mean one year of courses at the beginning of the programme plus three years of laboratory research afterwards. Such a model would improve the competitiveness of the graduates on an international level.	This recommendation generally follows the recommendation 2.1). The recommendation will be taken into account in our appeal to the MES regarding changes in the conditions of PhD programs
Criterion 3.2 Workload	
3.2 a) The University-wide Academic Policy states that the average student workload of PhD degree students must not exceed 57 hours per week; one hour auditorium workload must be followed by 7 hours self study workload. Even though this workload was considered very high by the auditors, the students confirmed that they can cope with their workload and think it is feasible and acceptable.	We agree with the students that the current workload (57 hours per week) is acceptable for them. At the same time, programs weekly workload may be reduced somewhat by prolonging the duration of PhD program.

Criterion 3.3 Teaching methodology	We agree with the comments of experts
Criterion 3.4 Support and assistance	Each year, the university invites a large number of foreign leading experts to give lectures, workshops, and consultations; furthermore, representatives of Springer, Thomson Reuters, Wiley, Elsevier, Oxford press, etc are regularly invited to conduct trainings. Also, students have the opportunity to travel for training to improve their skills at the expense of the university; in the future, the university will try to increase funding for this issue.
4. Examination: System, Policy and Forms	
4 a) For the modules stated in the module handbook only written examinations are foreseen, oral examinations are not mentioned at all. Even though the auditors acknowledged that oral presentations have to be made at conferences, the panel underlines that oral competences should also be fostered and developed during the PhD programmes and not only at conferences. Hence, it is recommended providing more opportunities to PhD students to orally present a scientific problem of their specialty and to properly explain measures of potential solutions also in English language.	Indeed, only written form is available for the exams. This form is acknowledged by many as very effective, because it allows students to develop their skills clearly express their thoughts in writing. Therefore, the use of the written form of the examinations seems to us to be justified. On the other hand, the oral form of examination is also present to a significant degree. This refers to the various types of intermediate control of students' knowledge. At the moment, the university introduced an intermediate control «Midterm exam» at 7-8 weeks with a different form of presentation: Oral exam, Closed book exam, open-book exam, open paper exam, Thinking exam, Take-home exam, Multiple-choice exam and shot-question exam.
4 b) The auditors found the number of seven papers per year quite high, and not really necessary to monitor the students' progress. The peers stressed the importance of high quality publications in international journals. Therefore, the peers recommended to the HEI to reduce the number of publications in local journals and stress the quality of publications instead.	In fact, 7 articles have to be published for the whole period of program and not per year. We do not believe such a number of articles to be excessive. It should be noted that the university, PhD students themselves and their supervisors are interested in the production of articles in international journals with high impact factor and reports at international conferences.

5. Resources	
Criterion 5.1 Staff	We agree with the comments of experts
Criterion 5.2 Institutional setting, funding and equipment	
5.2 a) The peers therefore recommended to the HEI to support start-up ideas to create a creative environment of innovative industries around the faculty.	In fact, the university and faculty have a business incubator, where students (including PhD students) can test their designs in practice. The problem is that commercially attractive designs still too low. Relevant activities are conducted at the faculty
6. Quality Management: Development and Enhancement	
Criterion 6.1 Quality assurance & enhancement	We agree with the comments of experts
Criterion 6.2 Instruments, data and methods	
6.2 a) The panel encouraged further use of the surveying, especially of alumni, since first cohorts graduated and could in the retrospective make better judgments on practical relevance, the adequacy of the academic programme, make some proposals on further development of the modules and also provide additional career mentoring for the younger students. The auditors encouraged the university to further broaden the instruments and methods used.	University (and faculty) understood the importance of the experiences and views of graduates to improve educational programs. A permanent work in this regard is conducted. Further expansion of the tools and methods can be to attract employers to develop PhD programs.
7. Documentation & Transparency	
Criterion 7.1 Relevant documents	
7.1 a) However, the peers found the degree of regulation in all PhD programmes too high to allow academic and organizational flexibility. Especially the regulations regarding publications, the number and frequency of written reports, as well as the selection of courses were to strictly regulated in the opinion of the peers. The peers therefore recommended to the HEI to reduce the degree of regulation in the respective areas.	In our opinion, management of PhD programs is not too rigid and does not interfere with the flexibility of programs. At the same time, the presence of regular reports allows to monitor the activities of students, aimed at writing a final theses and their successful defense. However, with increasing duration of PhD programs, frequency of students reporting may be reduced.

Criterion 7.2 Certificate upon conclusion	
7.2 a) Therefore the panel requested the submission of such certificate as additional document jointly with the comment of the university on this report. This document is needed for the final assessment of the programme.	Appropriate documents are presented in the appendix.

A general comment regarding the experts' report

Overall a positive report of ASIIN experts regarding PhD programs of cluster D (Programs of Department of Chemistry and Chemical Technology) indicates a fairly high level of of PhD students training. The faculty would continue to try to keep this high level.

Regarding the experts' comments:

- more than half of the experts' recommendations related to the change of state standards of PhD students training. The recommendation will be included to our appeal to the MES regarding changes in the conditions of PhD students programs;
- implementation of the remaining recommendations is within the competence of the faculty and the university, and in general have a positive impact PhD students training according to programs of cluster D.

F Summary: Peer recommendations (27.10.2014)

Taking into account the additional information and the comments given by the university, the peers summarize their analysis and **final assessment** for the award of the ASIIN certificate as follows:

PhD Programme	ASIIN Certificate	Maximum duration of certification
Technical Chemistry of Inorganic Substances	awarded with requirements	11.11.2019 (upon fulfillment of requirements)
Technical Chemistry of Organic Substances	awarded with requirements	11.11.2019 (upon fulfillment of requirements)
Technical Chemistry of Explosives and Pyrotechnical Produce	awarded with requirements	11.11.2019 (upon fulfillment of requirements)
Nanomaterials and Nanotechnology	awarded with requirements	11.11.2019 (upon fulfillment of requirements)
Petrochemistry	awarded with requirements	11.11.2019 (upon fulfillment of requirements)
Chemistry	awarded with requirements	11.11.2019 (upon fulfillment of requirements)

Requirements

For all PhD programmes

A 1. (ASIIN 7.2) A Diploma Supplement must be submitted for each programme in line with the model developed by the European Commission, the Council of Europe and UNESCO/CEPES.

Recommendations

For all PhD programmes

E 1. (ASIIN 7.1) It is recommended to reduce the degree of regulation regarding publications, reports and the selection of courses.

E 2. (ASIIN 4) It is recommended to reduce the number of publications in local journals and stress the quality of publications instead.

E 3. (ASIIN 4) It is recommended to introduce oral consultations instead of a written report to monitor the students' progress.

E 4. (ASIIN 2.4, 3.1) There should be no mandatory courses in a PhD program. It is recommended to introduce a pool of only elective courses, including soft skills.

E 5. (ASIIN 2.4) It is recommended to do more fundamental research in the degree programmes.

E 6. (ASIIN 5.2) It is recommended to support start-up ideas to create a creative environment of innovative industries around the faculty.

E 7. (ASIIN 3.4) It is recommended to introduce coaching of the students for an academic career.

E 8. (ASIIN 3.1) It is recommended to concentrate the courses and the teaching in the first year so that students can focus on their research work for the reminder of their studies.

E 9. (ASIIN 3.1) It is recommended to introduce a 1+3 year model to give more time for the research project.

E 10. (ASIIN 6.1) It is recommended to develop a consistent policy with clearly defined aims, methods and responsibilities for quality assurance and closing of the feedback loops. In addition, the students and other stakeholders should be involved in the quality assurance process more actively.

G Decision of the Certification Committee (11.11.2014)

Assessment and analysis for the award of the ASIIN Certificate:

The Certification Committee discussed the procedure and the proposed requirements and recommendations. They noted that one of their tasks was to ensure consistency in the decision-making among the different certification procedures. Thus, they decided that some requirements and recommendations needed to be transferred, deleted or edited for each of the procedures.

Accordingly, they made amendments to the requirements and recommendations. In particular, they did not consider the award of a Diploma Supplement, as reserved for First and Second Cycle degree programmes, reasonable whereas an informative leaving certificate or similar document would be beneficial for PhD holders.

Furthermore, they considered former recommendations 1 and 2 to be out of scope of the certification purpose, not least as the peer panels had viewed publication requirements to be generally favourable. In a similar manner, the Certification Committee found former recommendations 8 and 9 regarding the general structure of PhD programmes to interfere with Kazakh national rules and regulations while not targeting the improving of teaching, learning and research within the programmes.

The recommendation regarding the quality assurance system was amended to align it with the other procedures and acknowledge the fact that some quality assurance policies already exist.

The Certification Committee decides to award the ASIIN certificate as follows:

PhD Programme	**ASIIN Certificate**	**Maximum duration of certification**
Technical Chemistry of Inorganic Substances	awarded with requirements	31.12.2019 (upon fulfillment of requirements)
Technical Chemistry of Organic Substances	awarded with requirements	31.12.2019 (upon fulfillment of requirements)
Technical Chemistry of Explosives and Pyrotechnical Produce	awarded with requirements	31.12.2019 (upon fulfillment of requirements)

PhD Programme	ASIIN Certificate	Maximum duration of certification
Nanomaterials and Nanotechnology	awarded with requirements	31.12.2019 (upon fulfillment of requirements)
Petrochemistry	awarded with requirements	31.12.2019 (upon fulfillment of requirements)
Chemistry	awarded with requirements	31.12.2019 (upon fulfillment of requirements)

Requirement

For all PhD programmes

A 1. (ASIIN 7.2) A programme-specific leaving certificate or equivalent document has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems.

Recommendations

For all PhD programmes

E 1. (ASIIN 4) It is recommended to introduce oral consultations in order to better monitor the students' progress.

E 2. (ASIIN 2.4, 3.1) It is recommended to introduce soft skills and scientific working methods.

E 3. (ASIIN 2.4) It is recommended to do more fundamental research in the degree programmes.

E 4. (ASIIN 3.4) It is recommended to introduce coaching of the students for an academic career.

E 5. (ASIIN 6.1) Within the quality assurance policy, feedback loops and further development of the programmes should be carefully implemented. In addition, the students and other stakeholders should be involved in the quality assurance process more actively.