

**AL-FARABI KAZAKH NATIONAL UNIVERSITY**

**Approved  
at the meeting of the academic committee (SMC)  
of Al-Farabi Kazakh National University  
Vice Rector for Academic Affairs**

**\_\_\_\_\_A.K. Khikmetov  
Minutes No. 6 dated June 22, 2020**

**ENTRANCE EXAMINATION PROGRAM  
FOR ADMISSIONS TO THE DOCTOCAL PROGRAMME  
ON THE EDUCATIONAL PROGRAM "8D07501-METROLOGY»**

**ALMATY 2020**

The program is compiled in accordance with the main curriculum for the educational program "8D07501-Metrology". The program was compiled by doctor of physical-mathematical sciences, professor A.S. Askarova, doctor of physical-mathematical sciences, professor S. A. Bolegenova.

The program was considered at the meeting of the Department of Thermophysics and Technical Physics  
Minutes No. 38 dated 05.19.2020

Head of Department \_\_\_\_\_ Bolegenova S.A.

Approved at the meeting of the method bureau of the Faculty of Physics and Technology  
Protocol No. \_\_\_\_ dated \_\_\_\_\_,2020

Chairman of the method bureau \_\_\_\_\_ Gabdullina A.T.

Approved at the meeting of the Scientific Council  
Minutes No. 9 dated 05.29.2020

Chairman of the Scientific Council,

Dean of the Faculty \_\_\_\_\_ Davletov A.E.

Scientific Secretary \_\_\_\_\_ Masheeva R.U.

## CONTENT

### 1. Goals and objectives of the entrance exam in the educational program "8D07501-Metrology".

The entrance exam is designed to determine the practical and theoretical readiness of the undergraduate and is carried out to determine the conformity of knowledge, skills of students to the requirements of doctoral studies in the direction of training.

To achieve this goal, it is necessary to carry out the following tasks:

- comprehensive and systematic knowledge of regulatory and technical documentation in the field of standardization and certification;
- the ability to independent scientific and theoretical analysis of applied problems in quality management;
- the use of standardization methods to improve the quality of products and services.

The entrance exam form is a written exam. Examiners record their answers to questions on the exam ticket on the answer sheets. In the event of an appeal, the basis for consideration is the written entries in the answer sheet.

### 2. Requirements for the level of training of people entering PhD doctoral studies

Requirements for applicants who want to master the educational programs of doctoral studies in the educational program " 8D07501-Metrology»:

Applicant *must*:

- *be able* to freely navigate the fundamental and applied issues of standardization and certification, which was carried out within the framework of the educational program of the master's degree profile specialization;
- *have* an idea of the latest achievements of science and technology;
- *know* modern experimental, theoretical and numerical methods in the field of technical regulation in the world and in the Republic of Kazakhstan; current problems of quality management.

### 3. Prerequisites of the educational program

1. Technical regulation - 3 credits
2. MK 5208 Quality Management - 3 credits
3. Standardization and certification systems - 2 credits

### 4. List of exam topics

#### *Discipline "Technical Regulation"*

**Law of the Republic of Kazakhstan "on technical regulation".** Main ideas of the Global concept as a tool for eliminating trade barriers. European concept of mutual recognition.

**Methodological foundations of technical regulation.** Basic concepts in the field of technical regulation. The main goals and principles of technical regulation. Problems of enactment of the Law of the Republic of Kazakhstan "On Technical Regulation".

**The structure of the state system of technical regulation.** The constituent structures of the state system of technical regulation. Functions of the Government of the Republic of Kazakhstan in the system of technical regulation. The functions of the Authorized body in the field of technical regulation, standardization, confirmation of conformity and accreditation. Functions of State bodies and expert councils. Technical commissions for standardization. Conformity confirmation bodies, testing, measuring, calibration, calibration laboratories (centers). Forms of participation (rights and obligations) of individuals and legal entities.

**Normative legal acts in the field of technical regulation.** Foreign models of technical regulation. Methods of analysis and assessment of the acceptable risk of harm caused by the operation (consumption) of products. Normative legal acts in the field of technical regulation as a new form of document establishing safety requirements. Programs for the development of

regulatory legal acts. Establishing mandatory requirements in regulatory legal acts in the field of technical regulation.

**Technical regulation and the state system of standardization.** Methodology and organization of work on national standardization of foreign countries. Normative documents on standardization of the Republic of Kazakhstan. Voluntary application of standards. Scope of the standards. Resource support of activities within the state system of standardization.

**Confirmation of compliance.** Foreign experience of confirmation of compliance. European conformity assessment modules. The structure of the state system of technical regulation of the Republic of Kazakhstan in the field of conformity assessment. Forms and schemes of mandatory conformity assessment. Certificate of conformity, mark of conformity, declaration of conformity as a mechanism for building confidence in products (services). The competence of expert auditors to confirm conformity and accreditation. International and national organizations for personnel certification.

**State control over compliance with the requirements of normative legal acts in the field of technical regulation.** The system of state control. Responsibility of individuals and legal entities for compliance with the legislation of the Republic of Kazakhstan in the field of technical regulation. Legislation of developed countries in the field of product liability

### *Discipline "Quality Management"*

**Concept of quality. Basic terms and definitions.** Basic terms and definitions in the field of quality management. Quality management as a factor of enterprise success in competition. The history of the development of quality management systems

**Quality as an object of management.** The relationship of general management and quality management. Quality loop. Deming cycle. Quality management mechanism. Existing management systems and their essence. Total Quality Management System. The JIT system. Integrated product quality management system (IPQMS)

**Quality indicators and their evaluation.** Factors that affect product quality. Quality indicator. Methods for determining the value of quality indicators

**Quality cost analysis.** The cost of improving quality. Methods for evaluating the level of product quality

**The methodology of quality management.** Genesis of quality management systems. Japanese phenomenon in quality management. Universal quality management system (TQM). Russian experience in quality management

**Statistical methods of quality assessment and control.** Methods of statistical regulation of technological processes. Statistical methods of product quality control

**International standardization and certification.** ISO 9000 series quality system and standards. Certification of products, quality systems and production

### *Discipline "Systems of standardization and certification"*

**Standardization systems.** State system of standardization of the Republic of Kazakhstan (SSS). General Provisions Application area. Normative references. Standard development. General Provisions Organization development standard. Development of a draft standard (first edition). Development of a draft standard (final version) and its submission for approval.

**The system of indicators of product quality (SIPQ).** Unified Documentation System (UDS).

**Unified system of technological documentation (USTD).** Definition and purpose. Composition and classification of the complex of documents USTD.

**Certification systems.** State system of conformity confirmation. State regulation and management in the field of conformity assessment. National system of confirmation of compliance of the Republic of Kazakhstan. Accreditation and its characteristics

**The system of mandatory certification.** Mandatory certification of imported and domestic products.

**The system of voluntary certification.** State accreditation system.

**State system for ensuring the uniformity of measurements (TSM).** Normative documents on ensuring the uniformity of measurements. Systems of measurement methods and types. Classification of measurement methods.

## 5. List of recommended literature

1. Закон РК «О техническом регулировании» от 9.11.2004 г. № 603.
2. СТ РК 1.0 - 2006. ГСС РК. Основные положения
3. СТ РК 1.1 - 2005. ГСС РК. Стандартизация и смежные виды деятельности. Термины и определения.
4. СТ РК 1.2-2002. ГСС РК. Порядок разработки государственных стандартов.
5. СТ РК 1.13-2005. ГСС РК. Услуги государственных органов. Общие требования.
6. СТ РК 2.18-2003 «ГСИ РК. Методики выполнения измерений».
7. СТ РК 2.0-2001 «ГСИ РК. Основные положения»
8. ISO 9000:2005 Системы менеджмента качества. Основные положения и словарь.
9. ISO 9001:2008 Системы менеджмента качества. Требования.
10. ISO 9004:2009 Системы менеджмента качества. Рекомендации по улучшению деятельности
11. ISO 14001:2003 Системы экологического менеджмента. Требования.
12. Британский стандарт BS 6143 Руководство по экономике качества. Часть 1. «Модель затрат на процесс».
13. Аронов И., Версан В., Теркель А. Основные вопросы задания требований безопасности в технических регламентах//Стандарты и качество, 2003, сентябрь: [http://www.stq.ru/riaside/index.phtml?page=1&tbl=tb\\_88&id=653](http://www.stq.ru/riaside/index.phtml?page=1&tbl=tb_88&id=653)
14. Кравченко А. И. История менеджмента: Учебное пособие для студентов вузов. — М.: Академический Проект, 2000. — 352 с.
15. С. Джордж, А. Ваймерскирх. Всеобщее управление качеством: стратегии и технологии, применяемые сегодня в самых успешных компаниях. (TQM).-СПб, Виктория плюс, 2002.
16. М.Г. Круглов, Г.М. Шишков. Менеджмент качества (углубленный): - М.: 2000.
17. Утехин Г. Менеджмент качества: Конспект лекций. – Рига: Институт транспорта и связи, 2004. – 72 с.
18. Спицнадель В.Н. Системы качества в соответствии с международными стандартами ISO 9000: учебное пособие. - СПб.: Бизнес-пресса, 2000.-336 с.
19. Аскарлов Е.С. Стандартизация, метрология и сертификация. Учебное пособие.- Алматы: Домино, 2005-276 с.
20. Мырзабай М.М. и др. Основы стандартизации, метрологии, сертификации и менеджмента качества. Алматы, 2003.

### Additional

1. Лифиц И.М. Стандартизация, метрология и сертификация. – М.: ЮРАЙТ, 2005
2. Окрепилов В.В. Управление качеством: учебник для вузов/ 2-е изд.-М.:ОАО Изд-во «Экономика», 1998.
3. Сергеев А.Г., Латышев М.В. Сертификация: учебное пособие. -М.: Логос, 2001.-248 с.

4. Крылова Г.Д. Основы стандартизации, сертификации, метрологии. -М.: ЮНИТИ, 2000.
5. Никсон Ф. Роль руководителя в управлении качеством. – Москва, 1988.
6. Менеджмент систем качества. Под ред. В.Г.Фирстова. – Москва,1997.
7. Сергеева А.Г., Крохин В.В. Метрология: учебное пособие. -М.: Логос, 2001.-203 с.
8. Басаков М.И. Сертификация продукции и услуг с основами стандартизации и метрологии. -Ростов на Дону: МарТ, 2002. -255 с.
9. Практическая сертификация продукции и услуг / под ред. В.Я. Кершенбаум, Т.В. Горянстовой, М.: АНО «Технонефтегаз», 2001. -357 с.
10. Аристов О.В. Управление качеством: учебное пособие для вузов – М.: ИНФРА-М, 2003-240 с.

**6. Scale of assessment of the results of the entrance exam according to the educational program of doctoral studies PhD "8D07501-METROLOGY"**

Rating by letter system	The digital equivalent of points	% content	Rating using the traditional system	Competency Scale
A	4,0	95-100	Excellent	<p>This assessment is placed in the case, if the applicant:</p> <p>1) has an idea: about the main stages of development and paradigm change in the evolution of science; about scientific schools of the relevant branch of knowledge, their theoretical and practical developments; about scientific concepts of world and Kazakhstan science in the relevant field; about the mechanism of implementation of scientific developments in practice.</p> <p>2) knows and understands: current trends, trends and patterns of development of domestic science in the context of globalization and internationalization; knows perfectly a foreign language for scientific communication and international cooperation.</p> <p>3) can: organize, plan and implement the research process; analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions; analyze and process information from various sources; plan and predict their further professional development.</p> <p>4) has the following skills: critical analysis, evaluation and comparison of various scientific theories and ideas; analytical and experimental scientific activities; planning and forecasting research results; public speaking and public speaking at international scientific forums, conferences and seminars.</p>

A-	3,67	90-94		<p>This assessment is placed in the case, if the applicant:</p> <p>1) has an idea: about the scientific schools of the relevant branch of knowledge, their theoretical and practical developments; about the scientific concepts of Kazakh science in the relevant field; about the mechanism for implementing scientific developments in practice.</p> <p>2) knows and understands: current trends, trends and patterns of development of domestic science in the context of globalization and internationalization; knows perfectly a foreign language for scientific communication and international cooperation.</p> <p>3) can: organize, plan and implement the research process; analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions; analyze and process information from various sources; plan and predict their further professional development.</p> <p>4) has the following skills: evaluation and comparison of various scientific theories and ideas; analytical and experimental scientific activities; planning and forecasting research results; public speaking and public speaking at international scientific forums, conferences and seminars.</p>
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B+	3,33	85-89	Good	<p>This assessment is given if the applicant:</p> <ol style="list-style-type: none"> <li>1) has an idea: about scientific schools of the corresponding branch of knowledge, their theoretical and practical developments; about scientific concepts of Kazakhstan science in the relevant field.</li> <li>2) knows and understands: current trends, directions and patterns of development of science in the context of globalization and internationalization; knows a foreign language for the implementation of scientific communication and international cooperation.</li> <li>3) knows how to: organize and implement the process of scientific research; analyze and compare various theoretical concepts in the field of research and draw conclusions; analyze information from various sources; plan and predict your further professional development.</li> <li>4) has the skills: assessment of various scientific theories and ideas; analytical and experimental scientific activity; planning and forecasting research results; oratory and public speaking at international scientific forums, conferences and seminars.</li> </ol>
B	3,0	80-84		<p>This assessment is given if the applicant:</p> <ol style="list-style-type: none"> <li>1) has an idea: about scientific schools of the corresponding branch of knowledge, their theoretical and practical developments.</li> <li>2) knows and understands: current trends, directions and patterns of development of science in the context of globalization and internationalization; knows a foreign language for the implementation of scientific communication and international cooperation.</li> <li>3) knows how to: organize and implement the process of scientific research; analyze and compare various theoretical concepts in the field of research and draw conclusions; analyze information from various sources; plan and predict your further professional development.</li> <li>4) has the skills: assessment and comparison of analytical and experimental scientific activities; planning and forecasting research results; oratory and public speaking at international scientific forums, conferences and seminars.</li> </ol>

B-	2,67	75-79	<p>This assessment is given if the applicant:</p> <ol style="list-style-type: none"> <li>1) has an idea: about scientific schools of the corresponding branch of knowledge, their theoretical developments; about scientific concepts of Kazakhstan science in the relevant field.</li> <li>2) knows and understands: current trends, directions and patterns of development of science in the context of globalization and internationalization; knows a foreign language for the implementation of scientific communication and international cooperation.</li> <li>3) knows how to: organize and implement the process of scientific research; analyze various theoretical concepts in the field of research; analyze information from various sources; plan your further professional development.</li> <li>4) has the skills: assessment and comparison of analytical and experimental scientific activities; oratory and public speaking at international scientific forums, conferences and seminars.</li> </ol>
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