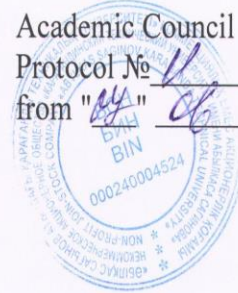


ABYLKAS SAGINOV KARAGANDA TECHNICAL UNIVERSITY

Academic Council
Protocol № 11
from "04" 06 2024 y.



**PROGRAM
THE ENTRANCE EXAM**

for applicants to the PhD program in the educational program
8D07302 "Production of building materials, products and structures"

Department: "Building materials and Technologies"

Compiled by:

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The doctoral entrance exam consists of writing an essay, passing a test for readiness to study in doctoral studies, an exam on the profile of an educational program and an interview.

Those who have a certificate (TOEFL IBT (Test of English as a Foreign Language Institutional Testing Program) take additional English language proficiency testing before the start of the doctoral entrance exam. The number of test tasks for additional English language proficiency testing is 100 questions. The maximum number of points is 100 points. Additional English proficiency testing is evaluated in the form of "admission" or "non-admission". To get the "admission" score, you must score at least 75 points.

Assessment of the doctoral entrance exam:

- interview - 20 points;
- essay - 10 points;
- passing the test for readiness to study in doctoral studies - 30 points;
- examination according to the profile of the group of educational programs - 40 points.

The passing score for admission to doctoral studies under the state educational order is 75 points, the passing score for admission to doctoral studies on a paid basis is 75 points.

The duration of the entrance exam is 4 hours, during which the applicant writes an essay, passes a test for readiness for doctoral studies, answers an electronic examination ticket consisting of 3 questions.

The exam on the profile of the educational program includes 3 questions, of which: the 1st question determines the level and consistency of theoretical knowledge; the 2nd question reveals the degree of formation of functional competencies; the 3rd question is aimed at determining systemic competencies.

When preparing for the exam, it is recommended to use the literature listed in the list, as well as modern periodical scientific and technical literature.

ESSAY

The essay is a reasoned written statement of the author's position on the problem on the basis of an independently conducted analysis using concepts and analytical tools of scientific knowledge.

The goal is to determine the level of analytical and creative abilities expressed in the ability to build their own arguments based on theoretical knowledge, social and personal experience.

The essay should not contain graphic objects, symbols and formulas. The recommended number of words in an essay is 250-300.

The topics of the essay for admission to doctoral studies in the educational program 8D07302 "Production of building materials, products and structures"

№	Essay Topics
1.	Industrial waste and local raw materials that are part of anticorrosive and flame retardant materials
2.	Modification of concrete and the effectiveness of their use in monolithic construction
3.	Modern technologies for the production of modified cement materials based on man-made waste
4.	Reduction of energy intensity and cost of production of Portland cement from industrial waste
5.	The use of industrial waste to produce geopolymer concrete
6.	Metallurgy waste — reserve of raw materials for construction materials
7.	Efficiency of recycling of construction waste by recycling method
8.	The use of waste for the production of polymer asphalt concrete
9.	The use of polyfunctional additives in monolithic concreting.
10.	The use of effective wall building materials, including cellular concrete

The list of subjects of the entrance exam for the educational program 8D07302

"Production of building materials, products and structures"

The questions for the exam on the profile of the educational program should assess the professional level of the examinee for his admission to doctoral studies and, in general, determine the competencies necessary for training in the scientific and pedagogical profile.

The program of the entrance exam for Module 1. (list of exam questions)

1. Technology of modern decorative and acoustic materials.
2. Cement dry mixes, building adhesives and putties
3. Scientific research methods in building materials science
4. Composition and purpose of expanding, non-shrinkable and alumina cements.
5. Composition features, basic properties and technical characteristics of poly-merbetones.
6. Purpose and properties of hydraulic concrete.
7. Liquid water-soluble chemical additives.
8. Agglomerated chemical additives.
9. Classification of modern concrete modifiers.
10. Additives that regulate the porosity of concrete mix and concrete.
11. Additives that give concrete special properties.
12. Additives that simultaneously regulate various properties of concrete mixtures and concretes (multifunctional action).
13. Characteristic features of fire development
14. Protection of building materials and structures from corrosion
15. Surface preparation for painting without removing rust
16. Converters and modifiers of corrosion products
17. Classification of industrial waste
18. Development of multifunctional building composites
19. Concrete is heavy for road and airfield surfaces. Classification, properties, composition, requirements for raw materials, scope of application.
20. Decorative concrete. Types, features of properties, composition, preparation and application.
21. Joint work of reinforcement and concrete. Advantages and disadvantages of reinforced concrete
22. Basic physical and mechanical properties of concrete. Concrete strength, grades and grades
23. Shrinkage and creep of concrete. Modulus of elasticity and elastoplasticity
24. Reinforcement for reinforced concrete structures. The purpose of the reinforcement, its classification. The main physical and mechanical properties of the reinforcement. Class and grades of reinforcing steels
25. Welded grids and frames. High-strength wire and products made from it: ropes, bundles. Reinforcement joints
26. Basic physical and mechanical properties of reinforced concrete. Shrinkage and creep of reinforced concrete
27. The concept of "innovation". Classification of innovations.
28. Evaluation of the effectiveness of research work: expertise, bibliometry, economic efficiency.
29. The concept of patent information. General information.
30. The effect of complex modifiers on the properties of cement pastes, concrete mixtures and hardened concretes.
31. Generalized dependence of concrete strength on various factors.
32. Products based on glass and stone melts
33. Impregnation and injection materials.
34. Investigation of the possibility of obtaining white cement based on silicate sludge

35. Research on the production of mayenite-belite cement based on electro-thermophosphoric slags
36. Technology of clay-free production of Portland cement from phosphorous compounds
37. Exergetic assessment of the use of waste in the production of building materials
38. Types and classification of cement-based dry mixtures.
39. Building adhesives and putties.
40. Properties of glass-crystalline materials and scope of application.
41. Factors affecting the properties of concrete mix and concretes.
42. Types of cements for the manufacture of hydraulic engineering concretes.
43. The role of hydrophobic additives in modern construction.
44. Classifications of hydrophobic additives.
45. Secondary material resources (WMR).
46. The main objectives of scientific research in the field of building materials, products and structures
47. Basic procedures for the formation of the purpose and objectives of scientific research
48. Basic concepts of innovation activity
49. The effectiveness of innovative projects. Types of effect from the implementation of innovations.
50. The concept of research methodology: empirical, empirical-theoretical and theoretical methods of cognition.

List of recommended literature

1. Нугужин, Ж.С. Модифицированный легкий бетон на стекловидном заполнителе: монография / Ж. С. Нугужин, М. А. Рахимов, А. М. Рахимов, Караганда: КарГТУ, 2020. - 132 с.
2. Основы производства пеностекло- и газостеклобетонных строительных изделий: учебное пособие для студентов, магистрантов и докторантов / Ю. М. Смирнов [и др.], Караганда: КарГТУ, 2019. - 70 с.
3. Ткач Е.В. Комплексное гидрофобизирующее модифицирование бетонов: монография / Е.В. Ткач, Издат.: ФГБОУ ВПО «МГСУ» 2011. – 232 с.
4. Антикоррозионные и огнезащитные строительные материалы: / А. Ш. Калмагамбетова, О. Б. Пахтеев.– Из-во: КарГТУ, 2015. – 85 с.
5. Основы научных исследований и инновационной деятельности: учебное пособие предназначено для студентов и магистрантов / М. Б. Искаков, С. Х. Есенбаев, С. Т. Алимбаев; - Караганда: КарГТУ, 2014. - 121 с.
6. Бархатов В. И., Добровольский И. П., Капкаев Ю. Ш. Отходы производств и потребления — резерв строительных материалов: монография/Челябинск: Изд-во Челяб. гос. ун-та, 2017. 477 с.
7. Шайкежан А. Высокоалитовый цемент: учебное пособие для студентов, магистрантов и докторантов, Алматы, 2018. – 160 с.
8. Баженов Ю.М. Технология бетонов. – М.:Изд-во АСВ; 2013 – 500 с.
9. Ежов В.Б. Технология бетона, строительных изделий и конструкций. Екатеринбург: Изд-во УрФу. 2014. – 207 с.
10. Евстифеев В. Г. Железобетонные и каменные конструкции. В 2 ч.
11. Ч.1.Железобетонные конструкции: учебник для студ. учреждений высш. проф. образования / -М. : Издательский центр «Академия», 2011. — 432 с.
12. Улицкий И. И., Ривкин С. А. Железобетонные конструкции: Расчет и проектирование / – М.: Книга по Требованию, 2012. –400 с.
13. Тихонов И.Н., Мешков В.З., Расторгуев Б.С. Проектирование армирования железобетона, Москва, 2015.- 276с.
14. Аскараров Е.С., Балапанов Е.К. Основы научных исследований. – Алматы: ИНТ, 2014.-198 с.
15. Технология бетона, строительных изделий и конструкций, Баженов Ю.М., Алимов Л.А., Воронин В.В., Магдеев У.Х., 2014.

16. Нугужинов, Ж.С. Модифицированный легкий бетон на стекловидном заполнителе: монография / Ж. С. Нугужинов, М. А. Рахимов, А. М. Рахимов, Караганда: КарГТУ, 2020. - 132 с.
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18. Садуакасов А.С., Шайкежан А., Баттаков С.Б. Высококалорийный портландцемент из нетрадиционного сырья Алматы, Изд-во «Гылым», 2011
19. Микульский В.Г. и др. Строительные материалы. — М.: Издательство Ассоциации строительных вузов, 2014. — 536 с.
20. Нугужинов, Ж.С. Модифицированный легкий бетон на стекловидном заполнителе: монография / Ж. С. Нугужинов, М. А. Рахимов, А. М. Рахимов, Караганда: КарГТУ, 2020. - 132 с.
21. Ежов В.Б. Технология бетона, строительных изделий и конструкций. Екатеринбург: Изд-во УрФу. 2014. – 207 с.
22. Ткач Е.В. Модификаторы в строительной технологии. Караганда: Изд-во КарГТУ, 2011. - 156 с.
23. Бархатов В. И., Добровольский И. П., Капкаев Ю. Ш. Отходы производств и потребления — резерв строительных материалов: монография / Челябинск: Изд-во Челяб. гос. ун-та, 2017. 477 с.
24. Аскарров Е.С., Балапанов Е.К. Основы научных исследований. – Алматы: ИНТ, 2014.-198 с.

**The program of the entrance exam for Module 2.
(list of exam questions)**

1. Improvement of technological processes in the production of building materials
2. The technology of porcelain stoneware production.
3. Manufacturing technology of plasterboard (GCL) and gypsum fiber sheets (GVL)
4. Production of modern polymer materials.
5. Principles of obtaining high-quality modified concretes.
6. Methods of preparation and application of effective concrete modifiers.
7. Methods of investigation of flame retardant properties of metal structures
8. Methods of investigation of fire-resistant properties of wooden structures
9. Methods of investigation of anticorrosive properties of metal structures
10. Mechanical and chemical methods of metal surface preparation before painting
11. Technology of application of non-metallic materials production waste in the construction industry
12. Technology for the production of refractory materials based on man-made raw materials
13. Technology for the production of autoclave materials based on aluminosilicate alloys
14. Technology of production of construction products from local ash and slag waste
15. Technology for the production of binders and concretes from mineral waste from local industry.
16. Technology of obtaining new building materials from slag-stone alloys.
17. Development of new types of composite binders.
18. Modern facade materials in modern building architecture.
19. The water content of cement systems and its effect on the strength of concrete, workability and average density of concrete mixtures.
20. Methods of winter concreting. Features of concrete hardening in the winter period.
21. Construction of logical schemes of scientific research: necessity, essence and purpose.
22. The main stages of the development and implementation of innovative projects.
23. Kinetics of heat release and mass transfer of cement systems with hydrophobic additives.
24. Technology for the production of lightweight concretes on porous aggregates.
25. Technology for the production of hydraulic engineering concretes.
26. Technology for the production of cellular concretes.

27. Technology for the production of decorative concrete for floors. Colored concrete.
28. Technology for the production of chemically resistant concretes.
29. Technology for the production of road cement concrete.
30. Technology for the production of asphalt road concrete.
31. Technology of concrete production for massive hydraulic structures.
32. Technology of preparation of fine-grained concrete mixtures.
33. Technology for the production of heat-resistant concrete.
34. Technology for the production of binders from industrial and man-made waste.
35. Technology for the production of film-forming materials.
36. Technology for producing effective types of concrete.
37. Methods of investigation of deformative, hydro- and thermophysical properties of heavy concrete.
38. Principles of obtaining polymerization and polycondensation polymers
39. Petrographic and electron micro probe analysis.
40. Technology for the production of electrical concrete.
41. Technological schemes for the preparation of liquid additives.
42. Technological schemes for the preparation of agglomerated modifiers.
43. Adsorption of modifiers in cement systems.
44. Strength, frost resistance and water resistance of concrete.
45. Methods of studying water absorption, capillary suction and deformative properties of concrete.
46. Technology for the production of heat-resistant concrete on aluminate cements.
47. Technology for producing slag binders. Describe two granulation methods.
48. Technologies for the production of gypsum binders of low water demand.
49. Technologies for the production of air binders. Classification of air binders by chemical composition.
50. Technology for the production of decorative concretes and mortars

List of recommended literature

1. Нугужинов, Ж.С. Модифицированный легкий бетон на стекловидном заполнителе: монография / Ж. С. Нугужинов, М. А. Рахимов, А. М. Рахимов, Караганда: КарГТУ, 2020. - 132 с.
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25. Башкатов Н.Н. Минеральные воздушные вяжущие вещества : учеб. пособие / Н.Н. Башкатов.— Екатеринбург : Изд-во Урал. ун-та, 2018.— 148 с

**The program of the entrance exam for Module 3.
(list of exam questions)**

1. The use of binders of low water demand and concretes based on them
2. Development of the theoretical foundations of building materials science – fundamental and applied research in the development of the theory of hydration of mineral binders, nanomodification, theory of composite binders.
3. The main methods of obtaining, properties and application of lime-slag binders.
4. Development and testing of multifunctional additives for building materials for various purposes, including nanoscale, functional and/or based on commercially available individual components, allowing to expand the functionality of building materials.
5. The subject and objectives of the methodology of scientific cognition.
6. Modification of building materials by polymers: modification of concrete, bitumen, wood, purpose and methods of modification.
7. Prospects for the development of production and application of polymer materials and products.
8. Development of technologies that reduce the energy intensity of the production of building materials, reduce the volume of waste from the construction industry, and involve man-made raw materials and construction waste in the production of building materials.
9. Development and improvement of materials for road construction – cement concretes, asphalt concretes.
10. Modern technological equipment for the production of anti-corrosion and flame retardant materials
11. Modern range of flame retardant materials based on polymers

12. The effect of film-forming agents on the flammability of flame-retardant coatings
13. The effect of flame retardants on the fire resistance of flame retardant compositions
14. The effect of fillers on the anticorrosive and flame retardant properties of coatings.
15. The use of coal enrichment waste (coal sludge) in the construction industry
16. The use of ferrous metallurgy waste in the construction industry
17. The use of non-ferrous metallurgy waste in the construction industry
18. The use of waste from the fuel industry (ash and ash and slag waste) in the construction industry
19. The use of waste from the wood processing industry in the construction industry
20. The use of waste from the oil refining industry in the construction industry
21. The use of municipal waste in the construction industry
22. Waste from chemical and technological industries and their use in the construction industry
23. Waste from the mining industry and their application in the construction industry
24. Organic waste and its application in the construction industry
25. The use of industrial waste in the production of concrete
26. The use of industrial waste in the production of ceramic materials
27. The use of industrial waste in the production of binders.
28. Methods of empirical research
29. The influence of the type of filler on the structure and properties of concrete.
30. The relationship between the rheological and technical properties of the concrete mixture.
31. Corrosion of reinforced concrete and protection measures against it. A protective layer of concrete
32. Hypothesis and inductive research methods
33. The role of domestic and foreign scientists in the research and development of compositions of anticorrosive and flame retardant materials
34. Problems of obtaining high-grade Portland cement.
35. Features of the process of hydration and structure formation of cement stone in the presence of a modifier.
36. The effectiveness of light concretes compared to heavy ones.
37. The effect of the type of modifier on the kinetics of strength increase.
38. Current trends in fine-grained concrete technology.
39. Features of the impact of aggressive media on concrete and reinforced concrete.
40. The main directions of development of technologies for the production of anticorrosive and flame retardant materials
41. Problems of obtaining a belite clinker.
42. Laws and their role in scientific research.
43. Methods of analysis and theory construction.
44. The basic principles of the direction of the topic of scientific research.
45. Tasks and methods of theoretical research.
46. Modern information retrieval systems.
47. Summary of modified concrete within the framework of the provision "composition-structure-properties"
48. The effect of complex additives on the technical characteristics and efficiency of concrete.
49. The main dependencies linking the characteristics and efficiency of concrete.
50. Types of scientific research experiments

List of recommended literature

1. Нугужинов, Ж.С. Модифицированный легкий бетон на стекловидном заполнителе: монография / Ж. С. Нугужинов, М. А. Рахимов, А. М. Рахимов, Караганда: КарГТУ, 2020. - 132 с.

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