

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER
EDUCATION

**“MOSCOW POLYTECHNIC UNIVERSITY”
(MOSCOW POLY)**

APPROVED

Vice-President for Academic Affairs
_____G.H.Sharipzyanova
« ___ » _____ 2021 г.

**Program of entrance exam for applicants for
the master`s educational program**

20.04.01 Technospheric safety

(Profile “Ecological safety in industry”)
(study in English)

Moscow, 2021

The program of entrance exam for the master`s educational program 20.04.01 “Technospheric safety” (profile “Educational safety in industry” (study in English)) is developed according to the federal state educational standard of master`s level of preparation 20.04.01 “Technospheric safety”.

1. Applicants are allowed to take the exam if they have an ID (the passport) and a signed paper, proving the presence of applied documents.

2. The form of the entrance test: an oral examination.

An applicant has 1 hour to prepare his or her answer to 2 exam questions, the time of answer to each question – 10 minutes max.

3. An applicant receives a mark **from 0 to 100 points**. A minimal passing limit is 40 points. The maximum grade for a single question is 50 points.

The grade for an answer to each question of the examination paper is determined according to the following criteria and rating scale:

- **50-40 points** – the answer reflects deep knowledge of the material; described theoretical positions are followed by real-life examples; the applicant has a personal point of view on the question; the answer is given in the professional language with the use of corresponding system of concepts and terms;

- **39-30 points** – the answer reflects the knowledge in the professional field with minor omissions; the applicant has certain difficulties with real-life examples to the theoretical positions; the applicant formulates his or her personal point of view on the question, but it lacks solid argumentation; the answer is given in the professional language with the use of the corresponding system of concepts and terms;

- **29-20 points** – the answer shows lack of knowledge in the professional field and is given with significant mistakes; the applicant is unable to make real-life examples to his or her answer and doesn`t have his or her personal point of view on the discussed matter; the material is not presented in the professional language;

< **10 points** – the applicant is unable to elaborate on the question, he or she doesn`t use (or know) the professional language, concepts and terms.

An applicant can receive 10 points in total (maximum) for his or her individual achievements (Table 1).

Table 1. Assessment of individual achievements.

No	Criterion	Criterion significance	Point(s)
1	Participation in University`s student research conferences, Olympiads, engineering competitions	Certificate of participation	1
		Winner certificate	2
2	Participation in All-Russian student research conferences, Olympiads, engineering competitions	Certificate of participation	2
		Winner certificate	3
3	Participation in international student research conferences, Olympiads, engineering competitions	Certificate of participation	3
		Winner certificate	4
4	State Examination Board recommendation to enter a master`s program	Abstract from the SEB decision	5
5	The presence of scientific publications	An article, published in the University magazine	5
		An article, published in the periodicals, recommended by	10

		Higher Attestation Commission or in international magazines	
6	Professional experience (at least 3 years)	Supporting documents	8
7	Professional experience (from 2 to 3 years)	Supporting documents	6
8	Professional experience (from 1 to 2 years)	Supporting documents	2

4. The use of reference literature, calculators, PCs, means of communication and other additional informational sources during the exam is strictly prohibited.

5. The applicants receive the information about the time of the exam and the place of the result announcement before the exam.

6. The applicants who violate the rules of conduct can be dismissed from the classroom **WITHOUT WARNING**.

The violator gives in all the exam materials. His or her full name and the reason for the dismissing will be listed in the exam protocol.

The violator can leave the classroom only after giving in all the exam materials.

7. The Selection Board members are not allowed to give any information on the exam papers to the applicants. If there`s a misprint or any other inaccuracy in an exam question, the SB members must note this fact in the exam protocol. The SB will analyze all notes; if a question is recognized as an incorrect one, it is considered as an answered one by the applicant.

In order to pass the entrance exam for the 20.04.01 program – Technospheric safety, the applicant must know the basic concepts of the subjects of the bachelor`s program “Technospheric safety”, namely:

1. General concepts of ecology

Ecology, its subject, objects of study, goals and tasks. The organization levels of living matter and ecological systems. Environmental factors and principles of their classification. Complex factors` impact, ecological optimum. The concept of the limiting factor.

2. Engineering methods of atmosphere protection

2.1 Problems of air basin protection from industrial and commercial emissions, power facilities and aspiration systems. Vented and fugitive emissions. Classification of pollution gases.

2.2 Removal of SPM from gases

SPM sources of generation. Aerosols and their fundamental properties. Dry mechanical dust collectors: dust chambers, inertial dust collectors. Cyclones.

Wet dust collectors (scrubbers). Scrubbers classification. Main construction types of scrubbers.

Gas filtering. Filter classification. Filtering materials. Fibrous filters. Air filters. Fabric filters.

2.3. Gas filtering from gases and vaporous pollutants

Technologies of absorption gas treating. Range of application. Constructions of absorption towers for emission purification from gases and vaporous pollutants.

Absorption methods of purification. Range of application.

3. Engineering methods of hydrosphere protection

3.1 Quality criteria of natural, fresh and sewage water. Sources of water contamination.

3.2 Mechanical sewage water treatment

Methods of colloidal mineral matters removal. Gravitational deposition mechanism. Sedimentation tanks.

The use of centrifugal force for sedimentation. Centrifuges and cyclone separators.

Filtration. Filter classification for sewage water treatment. Types of filtering beds and ways of regeneration.

3.3 Chemical and physicochemical purification of sewage water

Sewage water neutralization. Applied neutralization methods. Sewage water treatment with the application of membranes. Methods of membrane regeneration.

3.4 Biological treatment of sewage water

Modern technologies and equipment of biological treatment of sewage water. Constructions for biochemical sewage water treatment in aerobic and anaerobic conditions. Main constructions for biochemical sewage water treatment in natural conditions.

4. Engineering methods of lithosphere protection

Solid domestic waste (SDW) - morphological composition, sources of generation, standards of accumulation.

Technologies of SDW disposal. SDW landfill construction. Landfill re-cultivation.

List of recommended reading materials

1. A.I. Rodionov, V.N. Klushin, V.G. Sister “Technological processes of ecological safety”. Student’s book. N. Bochkareva publ., 2000. – 800 pages.
2. A.S. Timonin “Engineering and ecological book of reference”. Vol. 1, 2, 3 - N. Bochkareva publ., 2003. – 2825 pages.
3. D.A. Krivoshein, P.P. Kukin, V.L. Lapin “Engineering protection of surface water from industrial waste”. Training manual. – M.: Higher School, 2003. – 344 pages.
4. A.I. Rodionov, U.P. Kuznetsov, G.S. Soloviev “Biosphere protection from industrial waste”. Student’s book. – M.: Chimia, 2005. – 392 pages.
5. A.M. Gonopolskiy, V.E. Murashov “SDW treatment” Training manual. – M.: MGUIE, 2012.
6. I.A. Shilov “Ecology”. M.: Higher School. 1997.

Training programme manager
“Ecological safety in industry”



N. Danilenko