

**THESIS ON INTERNATIONAL COMPETITION OF
SCIENTIFIC AND ENGINEERING WORKS BY HIGH SCHOOL STUDENTS
SCIENTISTS OF THE FUTURE
WITHIN THE FRAMEWORK OF THE RUSSIAN FESTIVAL OF SCIENCE**

International competition of Research, *Scientists of the Future 2018* is organized within the framework of the VIII Russian Science Festival *NAUKA 0+* by the Ministry of Education and Science of the Russian Federation, the Russian Academy of Sciences, Lomonosov Moscow State University and by its project - Scientific Creativity Lab *LANAT*.

IX competition *Scientists of the Future 2018* (hereinafter "competition") is organized within the framework of the VIII Russian Science Festival *NAUKA 0+* and XIII Festival of Science in Moscow by the Ministry of Education and Science of the Russian Federation, the Russian Academy of Sciences, Lomonosov Moscow State University and by its project - Scientific Creativity Lab *LANAT* (hereinafter "organizers").

The competition is international in terms of its participants and jury. The competition is the national (Russia) finale of the World Scientific and Technical Review of INTEL ISEF. The winners of the competition have the priority right to join the Russian national team at the Beijing Science Competition and the International Conference of Young Scientists.

Official website www.intel.festivalnauki.en

This thesis describes the organizational and methodological components of the competition, the tasks, criteria and procedures for assessing the results of work or other achievements. The regulations specify the place, terms and the order of submitting the entries, the size and form of the promotion for winners, as well as the procedure and terms for announcing the results of the competition. This thesis is subject for a public publication from the moment of approval.

Participants of the competition are schoolchildren, students of 9-11 forms in Russia and corresponding classes in foreign countries. **The supervisors of the participants** are professional scientists, teachers, parents, etc., under the guidance of whom the research presented was directly carried out. **Accompanying of the participants** are adults authorized to accompany participants from / to the place of residence to / from the competition site and who are responsible for their life and health during the competition. The language of the competition is Russian, for foreign participants - Russian or English. All participants should be able to summarize the main points of their work in English for foreign members of the jury.

The winners of the contest will become participants of the Russian national teams at:

- INTEL ISEF, The Intel International Science and Engineering Fair (USA, May 2019) - the largest pre-college scientific research event in the world;
- Beijing Contest of Scientific Works (PRC, March 2019);
- International Conference of Young Scientists (Malaysia, April 2019).

In 2018 the full-time part of the competition is held:

1. On the site of the All-Russian Science Festival in Moscow (hereinafter the site "Moscow").
2. On the site of the summer scientific and educational school of Moscow State University "LANAT"
(hereinafter, the site "LANAT").

It is possible that some other sites will be used for a full-time part of the competition, this information will be announced on the official website. The participant or his supervisor chooses independently any of the

declared sites where they would present their work. The participants of the competition and their supervisors have equal rights and responsibilities regardless of the site on which they present their work. The winners of the competition are determined regardless of the site of participation.

Stages of the competition:

- September 25, 2018 - the registration is closed and works cannot be uploaded for the correspondence stage
- October 2, 2018 - the correspondence stage results are being announced and the list for the full-time stage of the competition is formed
- October 12 -14. 2018 - full-time stage in Moscow, announcement of the winners of the full-time stage and the participants of the super-final
- December 15, 2018 - the admission for the Super Final is closed
- January 20, 2019 - announcement of the Super Final winners and the team members for the World Scientific and Technical Review of INTEL ISEF
- May 12-17, 2019 - World Scientific and Technical Review of INTEL ISEF (Phoenix, USA)

Goal of the competition.

The contest *Scientists of the Future* is aimed at supporting gifted children, developing interest in studying exact, natural and engineering sciences among schoolchildren, creating conditions for the intellectual development of students, disseminating and popularizing scientific knowledge, and improving the pedagogical qualifications of teachers in Russia and other countries.

Categories of the competition.

The competition is divided into the following categories:

- Physics;
- Mathematics;
- Chemistry;
- Biology and Life Sciences;
- Programming;
- Geology and Earth Sciences;
- Technologies and engineering sciences
- Electronics, electronic gadgets, Internet of things;
- 3D modeling and prototyping.

Also, projects that contribute to overcoming technological barriers within the framework of “Roadmaps” of the National Technology Initiative take part in the competition.

The organizers of the competition reserve the right to add other categories. Information is posted on the official website of the contest.

Participation is free of charge.

The full-time participants of the contest and their supervisors are provided with a free accommodation and two-times meals in Moscow.

The participants and all accompanying people pay independently for getting to and from the site.

Students of middle classes (6-8 forms) and junior ones (3-5 forms) can take part in the section "Prospective Scientists of the Future" only by decision of the organizers. Section "Prospective Scientists of the Future" ends up with the full-time stage of the competition.

Applications for participation in the contest are accepted both from a supervisor of a student (in this case the supervisor registers his participants), and from students themselves (who in this case indicate their supervisor).

Accompanying people are registered separately after announcing the results of the correspondence round. The application is made during registration on the site of the competition.

Individual or team (performed by two students) projects are accepted for the entry. The project manager guarantees that the project was carried out by not more than two students indicated during the registration.

Only those who registered on the website www.intel.festivalnauki.ru are allowed to participate in the competition. Works submitted by any other way are not allowed to participate.

Employees and relatives of organizers or sponsors are not allowed to participate in the competition.

The content of the projects and the requirements for the participants of the competition.

Projects should represent research made during the previous academic year, individually or collectively (performed by two students).

All the research presented at the competition must be performed by the students independently under the supervision of their scientific supervisor.

Projects that are purely demonstrative, that hold informational messages or the results of a literature review are not allowed to participate in the competition.

The project must be carried out with the necessary requirements for occupational safety and do not pose a threat to life and health of minors and their surroundings, as well as must not damage the environment.

Scientific fraud (plagiarism, forgery, use or presentation of other people's research, etc.) or misbehavior towards other participants is unacceptable at any stage of the competition process.

The admission of projects to the full-time stage of the competition is carried out on the basis of submitted applications, theses of scientific works (annexes 1 and 2), videos of up to 1 minute duration, in which the participant briefly describes the main points of his work and, if possible, demonstrates the current installation (if such is the subject of the competition). Selected projects will be invited to participate in the full-time competition.

There are only those projects allowed to participate in the full-time stage of the competition, presentations of which will be presented in the form of a stand (see Appendix 3).

The deadline for submitting applications.

Applications for participation in the competition are accepted until September 25, 2018 inclusive. The full-time participants will be selected and announced by October 2, 2018 inclusive.

For updates of the competition program it is recommended to check the website. The program of the contest will be posted there on September 25, 2018.

Form of support for the winners of the competition.

According to the results of the competition, the participants who took the 1st, 2nd and 3rd place in the designated categories will be determined and considered as winners of the full-time stage of the competition. The number of prize places can be increased.

All participants of the competition and their supervisors will receive certificates.

The winners of the contest will be awarded with diplomas and valuable prizes, and their supervisors will receive certificates and grants to support and develop the system of school scientific laboratories STEM-Centers.

A seminar will be held with the supervisors to exchange experience in conducting scientific and project activities among high school students, demonstrating the work of the winners of previous years.

Winners who have won prizes in each category will compete for the right to participate in the international finals of the Intel® International Science and Engineering Fair® (hereinafter INTEL ISEF), which will be held in May 2019 in the United States.

The selection of the participants for the international final of the contest will be chosen following the completion of the submitted scientific project and its presentation in person or on distance until December 15, 2018. The number of participants and projects at the international final is determined by the Society for Science & Public, it can not be regulated by the organizers of the competition. Conditions for travel and stay in the US will be announced later. More information about the INTEL ISEF competition can be found at www.societyforscience.org/ISEF.

The delegation for INTEL ISEF will be announced at the solemn events held at Moscow State University on the Day of Russian Science, February 8, 2019.

Please pay attention:

Participation in the INTEL® ISEF competition requires the mandatory obtaining of a non-immigrant visa for the United States, the necessary condition of which is the availability of a passport valid for at least six months from the date of the proposed departure from the United States (approximate date - May 20, 2019).

The procedure of issuing a US visa is in accordance with the rules established by the US State Department of and cannot be affected by the organizers of the competition.

The organizers of the competition are not responsible for the decision of the US State Department on the fact and timing of issuing a visa to a specific applicant and do not affect this decision.

The procedure for submitting and reviewing applications.

Applications from participants or their scientific supervisors for participation in the competition are accepted until September 25, 2018 on the website www.intel.festivalnauki.ru (see Annexes 1). Applications submitted by facsimile, e-mail, postal mail or otherwise different from the indicated method are not considered.

Applications received for participation in the competition are considered by the organizing committee as they become available, until October 2, 2018 inclusive. The applications are accepted until October 2, 2018 inclusive. The list of authors invited to participate in the full-time competition stage is posted on the contest website, the scientific supervisors of the selected works are notified at the e-mail address specified in application.

Selection of applications for participation in the competition on formal grounds (the application meets the conditions of the competition, the application meets the proposed form, completeness of information, compliance with the deadline for the application) is carried out by the organizing committee of the competition. In case of a non-compliance of the application with the above conditions, the organizing committee of the competition has the right to refuse to accept the application.

The decision of the organizing committee is final and not subject to revision.

By registering the application, the contest participants and their supervisor agree to provide the contest organizers with the permission to process their personal data, publish abstracts and information about the authors and their supervisor in print and electronic form.

Preliminary criteria for evaluating projects at the full-time stage of the competition.

The main criteria: the result of the research must be received personally by the participant. In case when the work was done in the research laboratory, the participant should be able to explain what his contribution to the work consisted of.

One part of the evaluation of the work is taking into account the clarity of the presentation of the following sections:

- 1.1. Statement of the problem and a brief introduction to the problem. The state of affairs in this area (a literary survey is desirable).
- 1.2. The purpose of the study.
- 1.3. The method of research and its difference from other possible methods. Comparison with known methods (known software, etc. depending on the research topic), knowledge of their advantages and disadvantages.
- 1.4. When using measuring equipment - the ability to explain the principle of the operation of devices, their accuracy.
- 1.5. Understanding which fundamental laws are based on the research method used, what are the limitations of the models under consideration.

The results of the study and conclusions should be presented in the form of a list.

The work plan should present a further research for six months.

Functions of the organizing committee and the jury of the competition.

1. Contest management is carried out by the director of the competition. The contest operator is the School Laboratory of Scientific Creativity (LANAT).
2. The director of the competition performs the following functions:
 - approves the chairman of the scientific jury;
 - agrees and approves the dates of the stages of the competition;
 - disseminates information on the conduct of the competition;
 - approves the results of the competition;
 - produces prizes and diplomas for the winners of the competition;
 - organizes the grand opening and closing ceremonies and the delivery of diplomas and prizes to the winners of the competition;
 - prepares a report on the results of the competition;
 - works with the sponsors of the competition.

Organizers do not hold a responsibility for the life and health of the contest participants during the days of the event.

3. Jury of the competition

The scientific jury consists of representatives of secondary education institutions, universities, representatives of the Ministry of Education and Science of the Russian Federation, Lomonosov Moscow State University, graduates of INTEL. The jury may include foreign experts. The composition of the scientific jury is approved by the director of the competition.

At the contest, in addition to the scientific, there also can be a jury of sponsors, a youth jury, and

other jurors, which is coordinated with the director of the competition.

Members of the scientific jury:

- organize evaluation of the projects of the participants at the full-time stage of the competition;
- approve the evaluation criteria;
- make proposals on the criteria for awarding participants (for each category);
- make proposals to the Organizing Committee on improving the organization of the competition,
- improving its scientific and methodological level, and eliminating the identified shortcomings.

Organizers of the Competition:

Lomonosov Moscow State University

119991, Moscow, GSP-1, Leninskie Gory, 1

Responsible representative from the Moscow State University: Sergeev Sergey Nikolaevich and Astapov Artem Sergeevich

Laboratory of Scientific Creativity "LANAT"

119991, Moscow, Leninskie gory, 1, Moscow State University,
Lomonosov building, Laboratory G-703

Appendix 1

**Application (registration form) for participation in the contest *Scientists of the future*
within the framework of the Russian Science Festival**

Please pay attention! The application should be filled in on the website of the competition intel.festivalnauki.ru during registration. Applications submitted by fax, e-mail or regular mail are not considered.

1. Information about supervisor:

- full name;
- academic degree, rank;
- contact number;
- e-mail;
- country of residence;
- city of residence;
- postcode;
- detailed home address: street, house, building, apartment;
- the name of the educational institution (place of work);
- full postal address of the educational institution;
- phone of the educational institution.

2. Information about the contestant (filled in for each student - the author of the project being registered):

- First Name Last Name;
- date of birth (dd / mm / yyyy);
- form year;
- contact number;
- e-mail;
- country of residence;
- city of residence;
- postcode;
- detailed home address: street, house, building, apartment;
- the name of the institution;
- full postal address of the educational institution;
- phone of the educational institution.

3. Information on the research:

- name;
- category;
- the need to place any installation on the stand;
- a brief description of the installation, or a photograph;
- type of a project (individual or team);

Date of completion

Appendix 2

Theses

Please pay attention! The size of abstracts should not exceed 2 pages of typewritten text (not more than 6 thousand characters, font Times New Roman, 12, file format – PDF, max file size 15Mb). Optionally, figures, tables and other graphic images, can be attached to the abstracts separately. The total size of additional materials is no more than 3 pages (totally max 5 pages allowed). Abstracts must be uploaded to the contest website www.intel.festivalnauki.ru during or after registration. Abstracts submitted in a different way are not considered.

1. The abstracts of each work should contain the following information:

- name of the category;
- the name of the educational institution from which the work is presented;
- postal address, telephone, e-mail of the educational institution;
- the title of the abstract;
- surname, name of the author (s);
- form year;
- postal address, phone, e-mail of the author (s) of the abstract;
- surname, name, patronymic, position and place of work of the scientific supervisor;
- text of theses (not more than 6 thousand characters, Times font, size 12);
- the list of the literature used is located in the text of the theses under the heading "Literature".

2. The text of the abstract is a brief description of the work done, containing the following information:

- brief statement of the problem (the purpose of the research);
- the relevance of the problem and the possibility of its practical application (explain what determines the choice of the problem, what is its scientific and practical significance);
- a description of the methods for solving the problem (explain which research methods, experimental equipment and data processing tools were used in the research);
- analysis of the results obtained (state the main results obtained during the work, determine their value for scientific and practical use, evaluate their novelty, indicate why the results are better than those already available);
- literature used.

3. Format: page A4 in portrait orientation.

4. Example of abstracts (line by line):

Section: Mathematics

Secondary School No. 516, St. Petersburg

193315, St. Petersburg, Narodnaya st., 63

tel .: (812) 443-85-70; E-mail: director@sd516.nit.spb.ru

Distance from a point to a cone in Euclidean space

Kuznetsov Ivan

Form year: 11

193315, St. Petersburg, ul. Kuibysheva, 10, ap. 157

tel .: (812) 449-81-30; e-mail: ivan@mail.ru

Scientific adviser: Ivanova Lydia Petrovna, Ph.D., associate professor of the Department of Mathematics and Mechanics of St. Petersburg State University

Text of abstracts (not more than two pages of text)

Appendix 3

Video

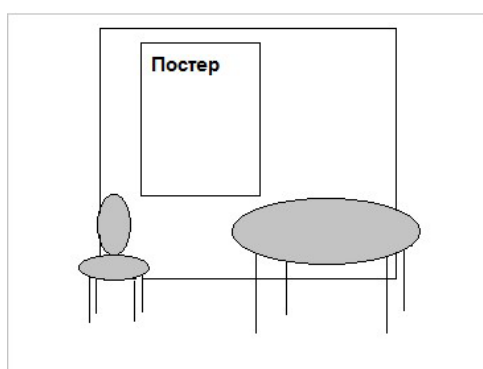
Each project should contain a downloaded video in mp4 (codec h.264) format, containing a short (not more than one minute) report of the participant (participants) of the project on the work done. Before downloading, the movie should be compressed to a size of not more than 150MB.

Appendix 4

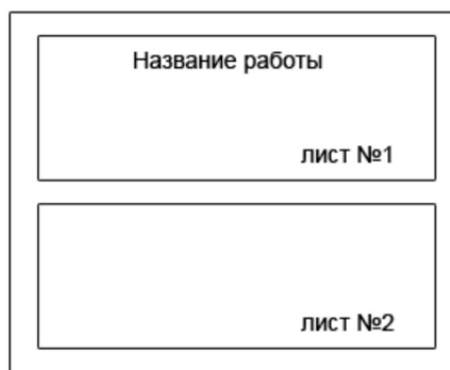
Requirements for the stand design

Authors of projects participating in the full-time stage must arrive at the site of the competition for which they registered to place their work. Time and place for collection of the materials will be separately indicated in the program.

Each project is provided with a separate stand, consisting of a structure for placing a poster, table and chairs (according to the number of authors of the work). The work is presented on a poster on the A0 format or on 2 sheets of a standard paper of the A1 size, located horizontally under each other.



A0 sheet placement on stand



2 A1 sheets placement

Scheme of the stand

Layout of the sheets of Whatman on the poster

The following printed materials should be presented at the stand:

1. Abstracts of the report.
2. Work plan (research).
3. Laboratory journal (preferably).
4. Additional printed materials illustrating the content of the work.

It is forbidden to place on the stands:

- living organisms: plants, animals and derived materials;
- samples of stones, soil;
- all kinds of chemicals, especially flammable and potentially dangerous to human health;
- any dangerous appliances (including sharp ones: needles, knives, etc.);
- photos of laboratory procedures of autopsy.

It is forbidden to demonstrate any experiments using chemicals, as well as open fire. Placement on the stand of any installation is preliminary agreed with the organizing committee. If it is necessary to use computers to present the report, the list of required software and hardware must be agreed with the organizing committee.

During the full-time phase, the authors of the projects should be near their stands for interview with the members of the scientific jury.