



НАНОТЕХНОЛОГИИ - ПРОРЫВ В БУДУЩЕЕ!

# **XII Russian Internet Olympiad “Nanotechnology – Breakthrough to the Future!”**

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## *Basic Regulations*



Lomonosov Moscow State University

Moscow

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## Introduction

Russian scientists have born ten years ago a new extraordinary tool for selection of talents and their career promotion - the Russian nanotechnology Olympiad “Breakthrough to the Future”. Nowadays, this official top level multidisciplinary Olympiad represents joint educational, scientific and PR activity of two co-organizers, Moscow University and Fund of Infrastructural and Education Programs, involving a wide range of participants – from young schoolchildren to young PhD scientists and teachers. The basic idea of the Olympiad has successfully transformed through the years into sharing and social implementation of achievements of advanced chemical, physical, mathematical, biological sciences related to nanotechnology innovations. At the moment, the 30 000+ participants are united into the virtual Nanoclub which plays the role of a core audience of the [www.nanometer.ru](http://www.nanometer.ru) site representing both the Olympiad Internet event and also a famous web portal of popular sciences. Such a combination attracts people since they learn new verified facts, present and discuss their ideas, earn new career pathways and contacts.

A quit unique feature of the Olympiad is related to a large number of social groups involved into the network Olympiad project lasting for years; many former schoolchildren participants take part in the Olympiad each year and thus grow up to the student and PhD status still participating in the Olympiad competitions of their level and even generating new authors of the Olympiad problems and increasing the population of its volunteers in different regions of Russia.

A key idea of the Olympic events of recent years falls into a sequence of three main stages of getting new knowledge and achievements. The first stage starts from publication of new complex tasks specific for each of the group of participants. The stage lasts intentionally for a month or even longer to allow the participants

searching and composing their original answers. The second stage of evaluation includes publication of official solutions and a distant discussion of participants' solutions. The meaning of this stage is not only a formal appeal but also a first contact of participants and the jury. The third stage is also important and it gives a chance to 30% of top participants to take part in the Olympiad in Moscow in person. The stage combines solving theoretical tasks and oral presentations of first research projects for schoolchildren, open panel discussions on educational ideas for teachers and a "black box" approach for evaluation of students. Finally, the Olympiad develops itself further and is ready to be implemented into international events and mutual collaboration between the countries provoking a beneficial exchange of ideas and students.

### **Strategy and Goal**

The main goal of the International Olympiad "Nanotechnologies – Breakthrough to the Future!" is an interdisciplinary competition organized for students at secondary and high school levels with the aim of attracting of interest of community to R&D in nanotechnologies and new materials. It is intended to stimulate the activities of students interested in chemistry by a way of the independent and creative solution of chemical, physical, mathematical and biological problems in materials science. The competitions help to facilitate cordial relations between young adults of different nationalities and encourage cooperation and international understanding of different generations of students, tutors and mentors.

### **Organizational Structure**

The chair of the Organizing Committee of the Olympiad is Rector of Moscow State University academician [Victor. A. Sadovnichy](#), two

vice-chairs are represented by the deputy rector academician [Alexey R. Khokhlov](#), and a dean of the Faculty of Materials Science of MSU academician [Konstantin A. Solntsev](#).

The Olympiad is organized in bilateral cooperation of Lomonosov Moscow State University and Fund for Infrastructure and Educational Programs. The Organizers decide on nominations and prizes for the competitors. The Organizers provide the Basic rules, the schedule of the Olympiad; that the organization of the competition will adhere to the regulations; the certificates and prizes presented at the official closing ceremony; all necessary arrangements for the observance of safety regulations.

All the educational features of the Olympiad are provided by [MSU Nanotechnology Educational Center](#), [Department of Materials Science](#), [Department of Chemistry](#), [Department of Physics](#), [Department of Biology](#), as well as by representatives from a number of leading Russian universities and institutes of the [Russian Academy of Sciences](#) invited to join the Methodology Committee and the Jury council of the Olympiad. The Supervisory Board of the Olympiad includes representatives of Russian research and business organizations playing the leading role in nanotechnology. The Olympiad team works closely with the [School League of RUSNANO](#).

The members of the Methodology Committee of the Olympiad are authorized by Organizers. The committee consists of the chair, vice-chairs and members including specialists in interdisciplinary materials science, biochemistry, biophysics, physical chemistry, simulations, and engineering. The Methodology Committee is responsible for overall educational and examination program of the Olympiad, appeal procedure and final scores discussion, choice of winners according to final individual scores of the competitors. The members and the chair are

obliged to maintain a professional discretion about any relevant information they receive during the Olympiad and must not assist any participants; they should keep the results secret until announced.

The Olympiad Jury consists of its chair and members. The chair and the members of the Jury are nominated by the Organizer. The Jury includes specialists in biology, chemistry, mathematics, physics in relation to nanomaterials and nanoengineering. The Jury is in charge of the actual competition and its supervision according to the regulations. The chair of the Jury calls and chairs the meetings of the Jury concerning the current competition, correcting and marking. The Obligations of the Jury are to discuss in advance the competition tasks, their solutions and the marking guidelines, give comments on problems and solutions; monitor the examination and its adequacy to the regulations, make a decision on the exclusion of a participant from the competition; correcting and marking of the examination papers and guarantee that all participants are judged by equal criteria; participate in the appeal procedure. The Jury must not assist any participants and should keep the marking and the final scores secret until announced.

The Supervisory Board of the Olympiad includes representatives of Russian research and business organizations playing the leading role in nanotechnology R&D and commercialization. The Supervisory Board provides organizational oversight for the Olympiad. It is not empowered to make any decisions affecting the Olympiad results that would interfere with the duties of the Jury.

## **Participants**

The Olympiad allows the participation of primary, secondary and high school students, BSc, MSc, PhD students, young scientists, teachers and tutors, or enthusiasts of materials sciences and nanotechnologies. To

receive a participant status on line, a minimum of personal information is required. All the stages of the Olympiad require no payment. Competitors must be Russian or English speaking persons.

Competitors should get an access to the Internet network to download texts of the problems and submit their solutions individually using their personal login and password.

To become a participant of the Olympiad applicant should register at the official web-side of the Olympiad, confirm his/her agreement for participation and his/her permission for publication of the minimum of his/her personal information, including full name and family name, date of birth, sex, country and city in open statistics of the Olympiad.

## **Competitions**

A basic theoretical stage is demanded for schoolchildren in the form of on line (distant) competition in the set of four school disciplines: “chemistry”, “physics”, “mathematics”, and “biology”. The Olympiad is assigned officially the highest 1<sup>st</sup> level Olympiad of the [Russian Council for School Olympiads](#).

Various satellite conquests of the Olympiad make it possible for the participants to demonstrate their skills, experience and creativity:

- “Genius' thoughts” is the competition of school projects in materials sciences and advanced technologies. Schoolchildren of 12+ age should submit a short description of their projects to win a chance to present it in person as an oral talk during the final stage of the Olympiad in Moscow.
- “Nanotutor” is a competition for tutors of school research projects.
- “Simply about complexity” is the competition for BSc, MSc and PhD students, young scientists who have already published their

research results in high - rank scientific journals and can also explain their results for publics as a popular illustrated paper.

All the problems proposed for competitors deal with nanotechnology, materials science and engineering. Most of the tasks are focused on the problems of nanomaterials, optics and photonics, medicine and biotechnology, energy efficiency, formation of coatings and modifying of surfaces. The problems are assembled in four blocks – Biology, Chemistry, Mathematics, and Physics according to four corresponding school subjects – each block of 10 problems. All problems should be proposed in either Russian or English languages to maximize the number of countries involved. All problems of the online stage of the Olympiad are published at the official web-site of the Olympiad <http://enanos.nanometer.ru>.

### **Organization of the Olympiad**

The Olympiad is organized every year beginning in the middle of November with the final results announcement by the end of April.

The official web-site of the Olympiad is a portal of scientific information [www.nanometer.ru](http://www.nanometer.ru) and, technically, <http://enanos.nanometer.ru>. All applicants should register for participation using the official site of the Olympiad as noted in official press releases. No other web-sites should be used for the registration of participants.

Each competition has at least two stages: first one is online or distant, and the second (final) stage is traditionally organized at Lomonosov Moscow State University. Both the stages include registration of participants, fixed time to solve problems with fixed deadline for all, appeal procedure, and publication of official stage results.



Duration of an online (distant) stage is about one or two months, usually from December 1st to January 31st. The results of the first stage are to be published by the middle of February. The second step is an individual in person competition for the best participants of the distant stage. According to decisions of the Jury, the best competitors of the Olympiad could be suggested as winners in various nominations and being awarded by certificates and prizes by the Organization Committee.

Official results of the individual competition and a photo report from the Closing ceremony are to be published on the official web-site of the Olympiad.

The online stage of the Olympiad requires a personal registration of each applicant at the official web-site of the Olympiad as a member of the Club of the Olympiad. The deadline for the solution submission is January 31st. The deadline could not be changed for any participant even in case of any extenuating circumstances. The number of the first stage participants invited as competitors for the second (final) stage are decided by the Organizers. Organizers assist participants with registration and uploading processes if any technical problems take place.

Participants invited for the final stage should carefully verify the accuracy of their personal information submitted including full names, date of birth, living country and city. After the registration for the final stage of the competition, all changes of submitted personal information are excluded. The registration of competitors performs by representative of the Organizers only. The registration is required for all participants independently on their age and home country. The examination consists of four independent sessions which correspond to four blocks of the problems. The examination sessions are organized in two or three days consequentially. Each schoolchildren competitor is expected as a participant of four examination sessions of the Olympiad. If the



participant does not intend to come for the session, he/she should inform the Organizers before the beginning of the exam.

The safety regulations announced by the Organizers are obligatory for all the participants. The Olympiad is a personal competition. No cell phones or other electronic devices are authorized. A pocket calculator is allowed only for biology, chemistry and physics sessions, but not for mathematics. The competitor is allowed to take a bottle of non-carbonated water to the examination room. The number of points for each subparagraph of the task is given in a package with exam tasks. Examination packages must not be signed anywhere by the competitor. After the session, all solutions must be impersonalized and personalized back only after the evaluation procedure. The personalization / impersonalization procedures have to be provided by the Organizers.

Solutions of the competitors must be corrected and marked if they are impersonalized only. Organizers provide personalization of the results as soon as the Jury finished their evaluation. Each participant has a right to appeal to raise his/her points. The appeal is possible in one day, next one after the publication of the preliminary marking results, according to the Olympiad program. After the appeal procedure, any discussion about the final score is not allowed for the participants.

Official results of the competition and the number of honor nominations and certificates are decided by the Organizers. The number of winners must not exceed 10 % of the number of final stage participants. Traditionally, the first winner of the Olympiad is the competitor who has the maximum sum of two scores for on line and final stages. The second winner is the competitor received the maximum score at the final stage. Each participant of the final stage receives the certificate of participation. In addition to the certificates, other prizes may

be awarded. The total number of awardees is up to 30 % of the final stage participants.

### **Fundings**

No participation fee is allowed. Organizers may decide by themselves to cover travel costs of the participants to the designated airport / station or to the location where the competition is held while the accompanying persons are not normally included in the list of support. All costs incurred in the connection with the organized program, including the costs of accommodation in the nearest hostels of Lomonosov Moscow State University and participant package, are covered by Organizers. Standard participant package comprises a guide with the competition program, plan with marked key buildings of the Olympiad, a pen and a writing pad, participant badge as a pass to the key buildings during the competition.