



# Catalyzer

Issue №1, July 2006

**It is a great honor for us to welcome the participants of the 39th International Chemistry Olympiad!**



Young scientists from more than 60 countries will come to Moscow to demonstrate their theoretical knowledge and practical skills and, what is more important, to exchange new ideas in chemistry.

All our life is anyway connected with

chemistry. Chemical industry is one of the leading branches of many national economies, and chemists make an essential contribution to national scientific and technical potential. Chemistry also plays an exclusive role in maintaining vital needs of society. I am confident that thanks to the International Chemistry Olympiad young scientists will discover many new applications of chemistry.

Talented youth is the «gold reserve» of any nation. And the goal of teachers, parents, state organizations is to support clever children and develop their creativity. Every child is talented in his own way, and it is very important to help him in revealing his abilities in proper time, to make him believe in himself. International Science Olympiads contribute a lot to solving these problems.

Hosting International Olympiads is of significant importance for our education system, since such outstanding events promote scientific knowledge both in Russia and all over the world as well as allow talented pupils to show their skills.

Participation in International Chemistry Olympiad is not only a great honor for each of you. It is also a serious responsibility because you represent your country. We hope that while staying in Moscow you will enjoy really friendly and warm atmosphere, find new friends and make significant contribution to the development of education and science!

I wish you every success in the Olympiad and great discoveries in chemistry!

Andrey Fursenko  
Minister of Education and Science of Russian Federation

**Dear participants, guests and organizers of the 39th International Chemistry Olympiad!**



Next year the Olympiad will be held in Moscow, at Chemistry Department of M.V. Lomonosov Moscow State University. It is a significant event for all of us because the founder of our

University, outstanding encyclopedist Mikhail Lomonosov, paid great attention to scientific research in chemistry. His results and discoveries are not widely known abroad, but in Russia we regard him a predecessor of Lavoisier. IChO in Moscow will be an original tribute to the memory of the talented scientist and enlightener.

Thanks to International Chemistry Olympiad, young scientists improve their knowledge, develop decision-making skills, strengthen competitive spirit and express themselves. Olympiad is not just a scientific competition; it is an important stage for young people in becoming personalities capable of changing the world for the better.

Moscow State University has always been a reference point in the educational system of Russia. At the same time,

exceptional importance of collaborative educational and scientific projects should not be forgotten. The International Chemistry Olympiad has proved to be effective for establishing contacts between scientists from different countries.

Science olympiads for secondary school students are an essential part of Russian educational tradition. Such form of competition convincingly proved its efficiency in achieving the main goal of every school: to search for talented pupils capable of thinking creatively and making independent decisions. Furthermore, Olympiads suggest the strategy of education development and prepare best students to studying in many universities.

M.V. Lomonosov Moscow State University is always open for those who care of education and science, for those to whom scientific research has become a guiding star!

We hope you will find many new friends here and enjoy your staying in Moscow!

V.A. Sadovnichy  
Rector of M.V. Lomonosov Moscow State University  
Professor, Member of Russian Academy of Sciences

## Welcome to Moscow!



Next July the International Chemistry Olympiad will be held in Moscow, the capital of Russia. The Olympiad will be hosted by Moscow State University (MSU), the oldest

and most famous University in Russia, and its Chemistry Department, one of the MSU leading education and research centers. The event is supported by Ministry of Education and Science of Russian Federation.

Moscow State University has a long lasting tradition of holding science Olympiads. These efforts enable us to distinguish talented young students interested in research and capable of bringing science to a new level. In this respect, we will prepare motivating problems for the forthcoming IChO, which will help students to reveal their

creativity and make them feel the beauty and variety of ideas of chemistry.

It is a great honor for us to host such an outstanding international event.

We will do our best to provide for fair competition and let all our guests experience the atmosphere of warmth and open-heartedness, as well as to give them an opportunity to make many new friends and enjoy remarkable sights of Moscow.

We look forward to seeing you next summer. Welcome to Moscow, welcome to

MSU Chemistry Department!

Valeriy Lunin  
Dean of MSU Chemistry Department  
Professor, Member of Russian Academy of Sciences



The Kremlin serves as the official residence and principal workplace of the President of Russian Federation

## HISTORY

The first reference to Moscow dates from 1147 when it was an obscure town in a small province. It became the national political capital during the reign (1462-1505) of Grand Duke Ivan III Vasilyevich. The seat of Russian government was removed from Moscow to Saint Petersburg in 1712. In 1812, during the Napoleonic Wars Russian patriots set fire to the city soon after entry of Napoleon; the resultant French withdrawal from Russia led to Napoleon's downfall. In 1918 the new government moved back to Moscow, and in 1922 the city was officially announced the Soviet capital. In 1941, during World War II, powerful Nazi armies were decisively repulsed at the approaches to Moscow. In 1991 the USSR was transformed into a number of independent states, and Moscow became the capital of Russian Federation. Since then, the emergence of market economy in Moscow has produced an explosion of Western-style retailing, architecture, and lifestyles.

## Culture and architecture

Moscow and St.Petersburg have for centuries been the sites of the country's internationally known history and culture, and the residences for most of its famous personalities. Moscow was once known as "sorok-sorokov" ("forty-times-forty"), in reference to many Orthodox onion domes making up the city's skyline. The look of the city was changed drastically during Soviet times.



The Red Square, Historical Museum



The Cathedral Of Christ The Savior is the tallest Eastern Orthodox church in the world



Main Universal shop (GUM)



Ostankino Tower - the tallest separately standing structure in Europe



Collection of the Pushkin Museum of Fine Arts offers masterpieces of West European painting



The Tretyakov Gallery houses one of the most celebrated collections of Russian art and artifacts in the world



Bolshoi (Big) is the most famous theatre, a centerpiece of Moscow

## Arts

There are many museums and galleries in Moscow with collections that can be compared to those of the best museums in the West. Frequent art exhibitions thrive on both the new and the classic, as they once did in pre-Revolutionary times. From their diversity in every branch of arts (painting, photography, sculpture and so on) it would appear that Moscow art world is steeped in many traditions: Russian, Western, Oriental, both old and new.

Two of the most notable art museums in Moscow are the Tretyakov Gallery founded by Paul Tretyakov and the Pushkin Museum of Fine Arts.

Moscow is also the heart of Russian performing arts including ballet.

## Education

There are numerous large universities in Moscow, including the renowned M.V. Lomonosov Moscow State University housed in the 240 m high tower on Vorobyovy Gory. Every day the University opens its doors to 50,000 undergraduates and 7,000 postgraduate students. Bauman Moscow State Technical University offers a wide range of technical degrees. Moscow State Institute of International Relations is Russia's best known school of international relations and diplomacy.



M.V. Lomonosov Moscow State University

## Business and Trade

A major part of Russia's profits and development is concentrated in Moscow. Many multi-national corporations have branches and offices in the city. Plush offices and lifestyles of a typical corporate employee in Moscow are practically indistinguishable from those in any other Western European city.



Moscow River Side Business Center



Moscow traffic jams



## Transport

Moscow Metro which spans almost the whole of the Russian capital is one of the world's most heavily used underground transport systems. It is well known for ornate design of many stations which contain stunningly beautiful examples of socialist realist art.



## The Chemistry Department of the MSU



The main organizing bodies of IChO-07 are Ministry of Education and Science of Russia and M.V. Lomonosov Moscow State University (MSU). In 2005 the whole Russia celebrated the 250th anniversary of MSU, country's first University. Many new facilities were passed to the operation to this date, including the new building of University library which will become the venue of some Olympiad events. The Main building of Moscow State University (it is in the center of 2007 logo) is a world recognized architectural monument, one of Moscow symbols. Most guests of our capital can admire it from outside only. And IChO participants will be invited in, since the Opening Ceremony is being planned there.



Both competition exams will be conducted at Chemistry Department, one of the biggest divisions of Moscow State University. Every day more than 1000 undergraduate students, 300 postgraduates and 2000 staff members enter numerous labs, halls and classrooms of Chemistry

Department. Founded more than 75 years ago, the Department contributed a lot to the progress in various fields of chemistry. Now it is the biggest and most rapidly developing center of chemistry education and research in Russia deeply involved in international collaboration. The leading educators of Chemistry Department always pay much attention to intellectual growth of new generations of scientists and search for young talented people in all, even most distant parts of the country. Thus, Chemistry Department has a long lasting friendship with chemistry Olympiads of different levels. A number of nowadays professors are involved in IChO-07 Science Committee. What is more, many former IChO participants from Russia and other countries are students at Chemistry Department now. They are strongly willing to contribute to IChO-07, and most of them will be involved in the work of Science and Organizing Committees.



Chemistry Department is also well-known for its traditions one of which is followed since 1966 when undergraduates of the 4th year (present dean Valery Lunin was among them) decided to make a special holiday uniting everyone: students, post-graduates, professors. They established the Chemist Day (the second Saturday of May) when thousands of students and graduates gather in front of the Department building and enjoy the show devoted to one of the elements of Periodic Table. The first feast in 1966 was devoted to hydrogen and in 2007 to ... (guess, which element).

### Valery Lunin: «At home even walls are helpful»



Valery Lunin, Dean of MSU Chemistry Department, Member of the Russian Academy of Sciences, Professor

- Professor Lunin, the first IChO in Russia was held in 1996. What, in your opinion, will be the main difference between that Olympiad and the forthcoming event?

- First of all, the number of participating countries significantly increased. In 1996, 45 countries participated, whereas next year we expect teams from nearly 70 countries. Furthermore, a lot of things have changed in our country during this decade, this being true for education and science as well. Mid-nineties were very difficult time for organizing Olympiads. But strong traditions, team spirit and high potential of Chemistry Department – all these helped to do practically perfect work. Many of those who were with us in 1996 will be involved in preparation of IChO-2007, and we will use all our experience to make the forthcoming Olympiad even better.

- Many people say that theoretical problems at IChO-1996 were extremely difficult. What is being expected for the next year?

- You are not quite right. The problems at IChO-1996 were not so difficult, but they were really creative. This made the students think, draw conclusions and suggest fresh ideas. This time we will also do our best to propose challenging still readily solvable problems. The slogan of the IChO-2007 is "Chemistry – art, science, fun". We will be very happy if while solving problems students feel incomparable beauty of chemistry, apply challenging scientific approaches and enjoy their own creative abilities.

- How many gold medals do you plan to win? Will Russian students feel additional pressure competing in the capital of their country?

- You see, medals and points are not very important for us, ideas of chemistry are above all. Still the forthcoming Olympiad attracts great attention in Russian chemical community. Many secondary school students are willing to participate in it, and I am sure we will have a very strong team. As to additional pressure, I don't think so. Russians have a proverb: 'At home even walls are helpful'.

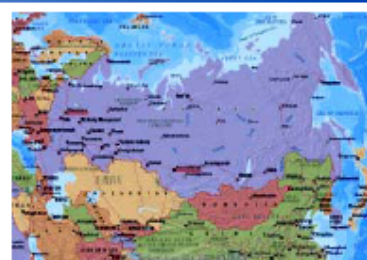
## Traditional Chemist Day in the MSU



- Population: 143.2 million
- Capital: Moscow
- Area: 17 million sq km (6.6 million sq miles)
- Major language: Russian
- Main religions: Christianity (mainly Orthodox), Islam, Buddhism
- Political system: Federative republic
- President: Vladimir Putin
- Main exports: Oil and oil products, natural gas, wood, metals, chemicals, weapons
- Currency: 1 ruble (100 rubles = 27 US dollars = 2.9 Euro)
- Temperature in July: about +25°C (in Moscow)
- Climate: moderate continental (in Moscow)
- Time zone (Summer): GMT +3 (Moscow) to +13 (Kamchatka, Far East)
- Internet domain: .ru
- Dialing country code: +7
- Russian cuisine: not spicy, mainly based on flour, potato, vegetables, meat and fish
- Traditional dishes: salty vegetables and mushrooms, herring, caviar, blin (kind of pancake), thick soups (borsch, solyanka, ochi, ukha), pelmeni (meat dumplings)
- Traditional drinks: soft drink kvass, light alcoholic meadovodka (with honey), and vodka (on occasion, allowed to 18+ only)
- Typical traits of character: hospitality, tolerance, collectivism, creativity



In mid-July 2007, 11 years since it last hosted the IChO, Russia will meet again the most talented young chemists from all over the world. There is no doubt that all IChO participants will experience traditional Russian hospitality and friendliness, while organizers will do their best to provide for fair and exciting competition. Most events of the Olympiad will be located in Moscow, the capital of Russia, its biggest political, economic, scientific, educational and cultural center. Moscow changed greatly during the last decade. Those mentors and guests who have attended IChO-96 will have a chance to compare their impressions and see restored historical monuments, modern buildings, business centers and highways,



new green islands which are always so charming inside big city. And those who will visit Moscow for the first time will undoubtedly enjoy unique Russian style which is based on long lasting traditions and readily open to everything new.

### Lessons in Russian

Yes – Да [da]  
No – Нет [net]  
Please – Пожалуйста! [pɐʃalujstə]  
Thank you! – Спасибо! [spasibo]  
Excuse me! – Извините! [izvinite]

Hello! – Здравствуйте! [zdravstvujte]  
Good bye! – До свидания! [do svidaniya]  
Hi! – Привет! [privet]  
See you! – Пока! [poka]  
Sure! – Конечно! [koneshno]

## Tentative program

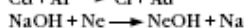
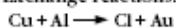
	Students	Mentors and Observers	Guests
July 15th Sunday	Whole day	Arrivals	
	Evening	Get-together party	
July 16th Monday	Morning	Opening Ceremony and Welcome Reception	
	Afternoon	Lab safety instruction	Lab inspections
	Evening	Recreations	1st Jury Meeting
July 17th Tuesday	Whole day	Excursion	Excursion
July 18th Wednesday	Morning	Practical Exam	Excursion
	Afternoon and Evening	Free time and Recreations	Discussions on Theoretical Exam, 2nd Jury Meeting
July 19th Thursday	Whole day	Excursion	Excursion
July 20th Friday	Morning	Theoretical Exam	Excursion
	Afternoon	Free time	
	Evening	Re-Union Party	
July 21st Saturday	Whole day	Whole day Excursion	
	Evening	Recreations	3rd Jury Meeting
July 22nd Sunday	Whole day	Excursion	Arbitration in groups
	Evening	Recreations	4th Jury Meeting, Allocation of medals
July 23rd Monday	Morning	Free time, shopping	
	Afternoon	Closing Ceremony	
	Evening	Farewell banquet	
July 24th Tuesday	Whole day	Departures	

## Unexpected chemistry (Real samples from MSU entrance exams)

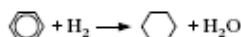


1) Extraordinary reaction equations:

a) Exchange reactions:



b) Hydrogenation of benzene



2) Teacher: How many  $\pi$ -electrons does the aromatic system of benzene contain?

Student 1. Square root of 3 (since  $2n^2 = 6$ ).

Student 2. Six (three beyond the ring, three – below the ring, in positions 2, 4, and 6).

3) Student: Tell me please, where is steel in the Periodic table.

4) Teacher: How can we separate bromoform and iodine?

Student: Add anti-bromoform.

5) Teacher: What is  $\text{H}_2\text{O}_2$ ?

Student: Distilled water.

6) Teacher: What is the simplest heteronuclear molecule?

Student: Naphthalene.

### Sponsors

