№7
July 20, 2013

CATALYZER

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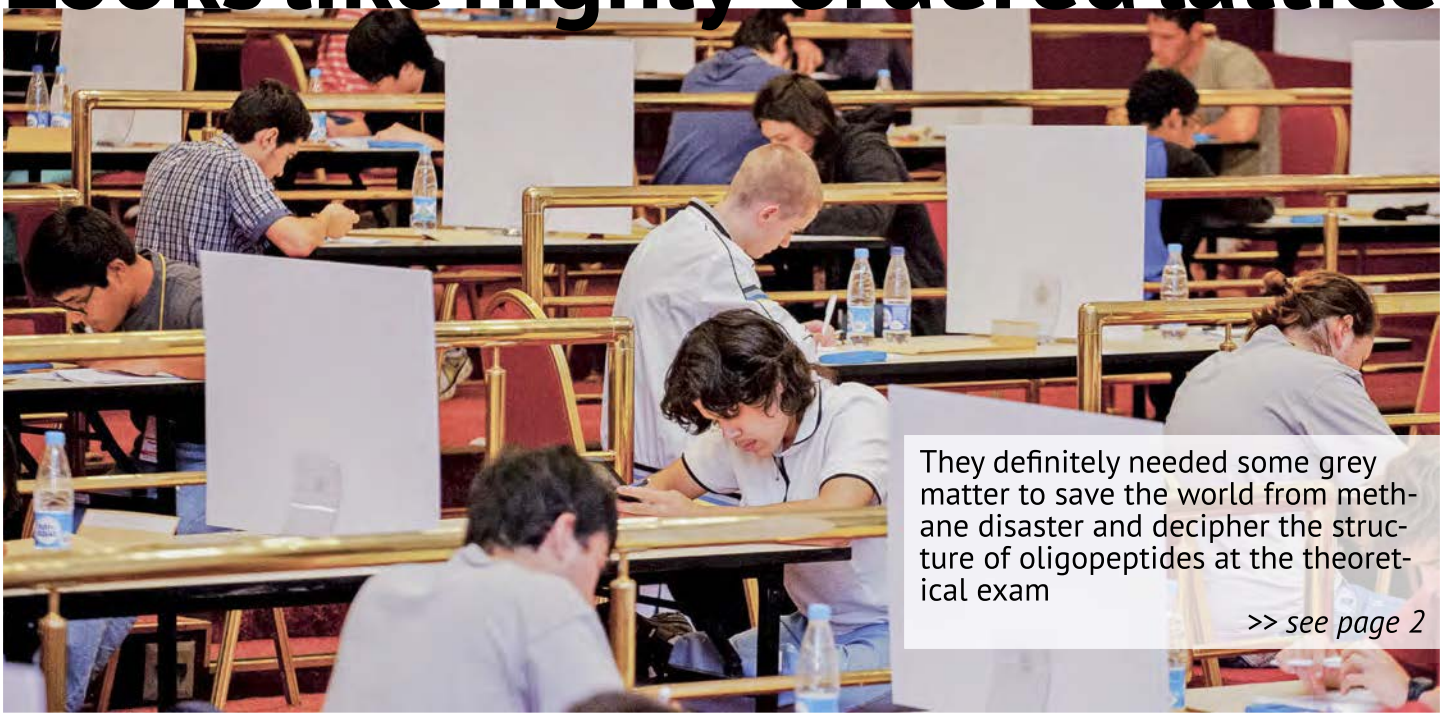
Looks like highly-ordered lattice



They definitely needed some grey matter to save the world from methane disaster and decipher the structure of oligopeptides at the theoretical exam

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Today is gonna be the day | *Catalyzer's tips on a Russian-style day*

9.00-10.00 Breakfast	Follow the famous proverb: "Eat your breakfast, share your lunch with a friend and give your dinner to your enemy". So eat your breakfast like a king. Focus on proteins and carbohydrates, you're going to have a lot of physical activity today. The menu offers rice or buckwheat porridge and French beans.
10.30-12.30 14.30-16.30 Paintball & "Adventure" game	To play paintball a la Russe use the following vocabulary: **Ура! [ooh-rah!] "hooray!"** – the word doesn't have a meaning, but you should cry it out with all your might when you're going into the assault or want to frighten the enemy with a false maneuver; **Мочи! [Moe-cheer!] "dip in liquid"** – If you want your partner to shoot; **Ёшкин кот! [Your-skin caught!]** – a kind of undefined cat Russians mention when they're not quite happy about what's going on. You can use it when a maneuver fails. **Не тормози! [knit-tar-muz-zee] «don't lag!»** – If the partner is doing something too slowly. At the end of the game embrace your enemy, pat him on the shoulder and say: **Брателло! [bra-teller] – "bro".**
13.00 Lunch	Try the Tartar azu, a traditional dish of one of Russian nations. Fried pieces of meat stewed with carrots, potatoes, onions and tomatoes.
16.30-18.00 Free time	Here are a few ways to spend your free time a la Russe. If you care for some privacy you can, as we say, «go for mushrooms» – "идти по грибы" [eat-tea paw gree-be]. After the rain under the trees you can find lots of them: boletus, aspen, etc. If you rather feel like socializing we suggest playing the popular «Mafia» game. It's much more interesting than the usual cards you love so much. «Mafia» requires attention, hazard and communication. It's believed that it came up at MSU campus. Ask your guide to teach you.
18.00 Dinner	If you want a Russian tea party you can use two ways of drinking tea: 1) **With lumps of sugar**. Sugar is not put into the cap, you bite a little piece of it before every sip and chew with a crunch; 2) **«White Tea»**: tea is drunk in a usual way, but you don't add neither tea nor sugar :)
21.00 Disco party	In Russia, especially in the backblocks, there is a disco tradition: all dancers put their bags in a big heap, make a circle around it and dance without changing location. Thus personal belongings are watched and protected.

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18:49 The reunion with mentors was planned to happen on board of a cruiser that was waiting for the Olympians at the pier of the "Ukraina" hotel. Mentors were a little late and Olympians having boarded on the ship found themselves alone among the laid tables, with the feeling that all the challenges are left behind...

Although just seven hours ago

The first task of the theoretical tour was be called "The clathrate gun". Participants were supposed to evaluate the impact of possible decomposition of methane hydrates located at the bottom of the global ocean. The release of huge amounts of methane and its auto-ignition when contacting the atmospheric oxygen was associated with the increasing temperature of the global ocean due to the greenhouse effect...

19:03 Mentors were a little late, the cruiser crew turned on the painfully familiar Boney M, and after listening to it for a few moments Olympians suddenly realized that all the tests are over and the reserves of methane hydrates at the bottom of the Moscow River must not be too big... A few moments later a multinational crowd of Olympians was dancing and enjoying life to the 1980s disco. The circle was dragging inward a Hindu, an Israeli, a German, and the crowd went wild every time. The future of chemistry was just getting down...

Six hours ago

Task number five was commented by MSU professor **Vadim Eremin**. A beautiful problem on a fundamentally new material graphene was about evaluating its properties, that are still difficult to measure. "The material is very promising, only we don't yet know what exactly it's promising and to who", – said Vadim jokingly.

The task supposed to extrapolate the graphite properties on those of graphene. It was easy to see Russian roots in the problem: since the invention of graphene brought a Nobel Prize to Russian-born physicists **Andrey Geim** and **Konstantin Novoselov** in 2010.

19:20 The ship departed and it was at this point when buses with mentors finally arrived. The students dashed to the left side of the ship, frightened that the river would carry them away from their beloved mentors forever... At the last moment the captain took a complicated maneuver and dropped a saving ladder ashore. Mentors boarded to embrace their pupils, and the celebration on the ship broke out with the renewed vigor.

Whereas five hours ago

The last out of eight tasks was commented by one of its authors, MSU Professor Alexander Gladilin. It concerned archaebacteria, a unique ancient microorganism that can produce energy by performing the reaction of methylamine with water.

Students were supposed to write the equation for this reaction and decipher the structure of the amino acid residues contained in the enzyme which catalyzes this reaction.

"Most guys are well aware of the 20 amino acids that are part of the protein, Professor Gladilin said. – But they tend to forget that in reality there are twenty two of these acids. It was precisely one of them, the twenty-second acid (pyrrolysine) that was featured in the problem".

19:45 The House of Government is seen through the open doors of the cruiser. Czech Republic is the first delegation to cross the protective chain banning access to the open deck, they are followed by the Kirghiz and the French who thus discover a simple truth: here, in Russia, if something is prohibited it's still possible. Five minutes later the whole Olympiad crowd gathers on the cruiser bow taking photos of the Novodevichy Convent, so the ship even begins lurching a bit toward the methane hydrates.

Four hours ago

"All the problems are constructed in a way that separate parts of them are relatively independent, – Professor Gladilin explained. If you don't do the job completely, you can still solve some of its parts. For each task (out of eight) you can score from 6 to 8 points. The maximum for the theoretical exam is 60 points (it was 40 points for the practical part)"

"Many problems were created by the previous winners of the competition", Vadim Eremin added. The first problem was proposed by the twice golden medalist (2001 and 2002) Chemistry PhD Igor Sedov. IChO gold medalist of 2003, now a PhD in physics and mathematics Alexander Belov was working over the third task. The idea of the eighth task belongs to the IChO winner of 1998, now a PhD Bulat Garifullin...

22:00 Behind me the medalists of the 45th IChO are dancing enthusiastically. None of them yet knows who will receive the gold or the silver. None of them knows who will make a breakthrough in medicine, or in the energy sector. Meanwhile they are just smart and (mostly) cheerful guys from 77 countries. Just simple guys who in the morning have saved the world from methane disaster and deciphered the structure of oligopeptides.

The first thing they did when turned their Devices on

Miguel Ramos, El Salvador
I send an e-mail to my parents to say that I'm fine and that I have finished my exams.

Oskar David Henriksson, Sweden
In fact I didn't use my phone at all, I just answered my e-mails from my computer. There were so many mails from my friends!

Bekhzodbek Boltaev, Uzbekistan
First of all I turned my phone on... And then answered text messages.

Evgeny Gulyak, Russia
I put my phone into the pocket. I didn't miss it at all.

Lautaro Vogt, Argentina
I called my cat and said "Meow"! I miss him so much!

Mentors' insights

Uno Mäeorg, Estonia
"I have been to Moscow several times before, but now it's got a new look. These skyscrapers looks very well, Russia develops with these new buildings and companies"

Kenneth Charles Hoffman, Canada
"I didn`t realize how important the religion was for the russian people. I can't express how I was surprised about this quantity of churches!"

Andrew Dicks, Canada
"Last time I was in Moscow we weren't using public transport. But today we used the train, and it was fantastic! It was fast and clean!"

Sunday Asher Adedeji, Nigeria
"Russia is very advanced now compared to my country. There are lot of fascinating buildings, the streets are so clean!"

Per Henning Lindgren, Sweden
"People are so kind and nice there, they're organized and everything's perfect! And you Russians know what you want"

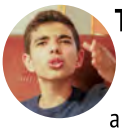
A Country in Brief — *Azerbaijan*

Every day Catalyzer picks a random delegation and goes to meet the team.

Team about Sona Adam Guluzade: the only girl in the team. She is very pretty and charming but a bit disobedient: every time we go for a walk, she suddenly disappears… Sona likes physical chemistry and organic chemistry for the fact that many things come up logically and she doesn't have to do much reading.

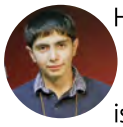
Sona on chemistry education in her country: School lasts for eleven years, but after the ninth it's not compulsory. As for chemistry, we start it at the age of 14. In our lyceum we have three chemistry classes a week while ordinary schools usually have two. At school we don't have any lab classes.

Sona on her country's contribution to chemistry: I should mention Vagif Abbasov who has some researches about inhibitors. His works are really appreciated all over the world.



Team about Javid Rafig Ahmadov: He likes sunflower seeds too much. Javid is very cheerful and jokes a lot. Has very strong sense of humor.

Javid imagines himself a great scientist: I would probably invent the substance which could make people disappear. You know, there are always unwanted people… So I suppose a substance like this could help to get rid of those people. I would probably name it "Javidinium".



Team about Murad Polad Rahimov: He easily gets angry. Murad doesn't like kidding and joking. He likes football, his favorite football player is Vagif Cavadov. Enjoys listening to national music Mugam.

Murad chooses his favorite substance: Benzoic acid because of the name and its unique chemical properties.

Murad on chemistry: In fact I am interested in science in general. I also like maths and biology very much!

Team about Balagardash Cabrayil Bashirov: he is good at explaining, both something he knows and what he doesn't know.

Balagardash chooses the most typical Azerbaijani of his team: When I look at Murad I see the typical Azerbaijani. He loves our country and respects our traditions. He is very patriotic. He also has black hair, black eyes, black eyebrows which is also very typical of our nation.

Victor Hugo and Albert Einstein alive

Victor Hugo and Albert Einstein came to visit IChO. No one expected that. Catalyzer talked to the guys about their famous names.

Victor Hugo Angulo-Cazarez from Mexico got his name due to his father, who's also Victor Hugo. As it turns out Victor Hugo is a very widespread name in Central and Latin America. Friends call him just Victor or VH. Victor admits the greatness of his famous namesake but he wouldn't want to be his relative. "I am what I am", Victor said.

"When my father was studying he came across the great physicist and became very interested in his works", **Alberto Einstein Flores Turpo** from Peru told us, "This is the reason why I have such name". Like his father, Alberto admires Einstein, especially the way he raised the physics to a new level and made a real breakthrough in his sphere.

photos by Nataly Ionova

Chemical structures on stamps

Part 1

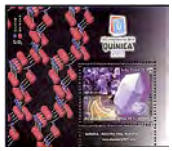
All science is either physics or stamp collecting.
Ernest Rutherford

Chemistry is definitely a science. We study nature by constructing models of atoms, molecules, colloid particles, complex systems, materials. Moreover, we not only study what was given to us but also create a new reality by synthesizing new substances and materials that never existed in nature. So it's not like a stamp collecting. Still chemistry is somehow related to stamps.

There's a peculiar part of philately called chemophilately, the pursuit of stamps related to chemistry – they turn out to exist in abundance!

Inorganic substances are usually presented in chemophilately by crystal structures of ionic compounds, typically – NaCl:

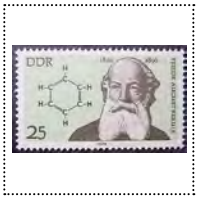
or minerals:



and various molecular structures – mainly of simple molecules:

An interesting stamp was issued in Great Britain in 2001 commemorating the centenary of Nobel Prize. One of the Nobel prizes in chemistry was awarded for discovering fullerenes – the new elementary form of carbon. The molecule of the most stable fullerene – C_{60} – is shown on the stamp. The stamp is heat-sensitive: when exposed to small heating it turns pale.

Another unusual structure is that of an inorganic cluster ion $Re_2Cl_8^{2-}$ with the metal-metal bond. Presented on a Soviet stamp devoted to the Institute of General and Inorganic Chemistry (Moscow) where this ion was first synthesized.



Structures of organic compounds on stamps are much more numerous and diverse. They present hydrocarbons (benzene is most popular)

as well as naturally occurring compounds,

and proteins.

Vadim Eremin,
Chemistry Professor,
MSU

To be continued.

Meet Russian Chemists

Nikolay Semenov
(1896-1986)

On the question of chemistry and stamps: as the only (!) Russian Nobel Prize awardee in chemistry, Semenov is depicted on a Russian stamp from a special set commemorating Nobel Prize Winners.

First steps in chemistry

As a schoolboy, he decided to test whether salt can be synthesized from active sodium and toxic chlorine. At his home laboratory he burned sodium in chlorine, took the sediment, salted bread with it and ate it! Later got physical education.

Contribution to chemistry

His main works are devoted to chemical kinetics. He developed the theory of branched chain reactions (for which was awarded a Nobel Prize in Chemistry in 1956), the theory of thermal explosion and the combustion of gaseous mixtures.
Discovered the ion-type heterogeneous catalysis and developed the theory of heterogeneous catalysis (1955).
Founder of the Institute of Chemical Physics (Moscow).

Fact

Semenov was 9 times awarded with the Order of Lenin, the highest prize of Soviet Union (which is almost the absolute record).

Quote: "If I had known chemistry I wouldn't have got a Nobel prize"

Happy Birthday!

IChO is celebrating birthday of **Felix Edar** from Austria, who's 18 today. For the occasion, «Catalyzer» asked his team to wish him something and give imaginary presents.

Martin Reiterer:
«I wish the competition will go well for him. And my present for him will be... a trip to the Moon».

Paul Lorenz Türtscher:
«Don't be sad about the restaurant! If I could present him anything I wanted, it would be a ticket to the Final of World Football Cup».

Felix Frank:
«I wish him not spend so much time thinking about the exam, and just be happy on his birthday, because he can't celebrate his birthday well».

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