Catalyzer

Journal of the 39th International Chemistry Olympiad Moscow Russia
Issue no.5 Wednesday 18 July 2007

From the past to the future

Wishes of Dr. Anton Sirota to our participants (Technical University of Bratislava, Slovakia)

Dear participants and Organizing Committee! First of all, I wish all of you success and victory! And as it was said at the Opening: There will be no losers, but only winners. Everybody who came to this Olympiad in chemistry is a winner.

I understand that it's very difficult to arrange everything properly because there are so many countries, so many participants! At first they will come through practical exam and then through theoretical and I do appreciate the tasks because they are really difficult. When I was organizing the Chemistry Olympiad in Bratislava in 1959 for the first time there were only three countries. Since that time the number of countries has been increased. In 1996 there were already 40 countries: the more countries - the higher responsibility and everything was perfect. Now there are 69 countries participating in the Chemistry Olympiad! It's a huge number.

Chemistry is a practical science; you should provide an experiment with all important facilities. Everything should be prepared preliminary: all chemicals, tubes and places to make an experiment, because it's not a theoretical science when you need only a pen.

I'm responsible for the preparations and for regulations from 1994. Everybody should be equal, without any exceptions. The International centre in Bratislava of Olympiad in Chemistry was very active. In 1987 we made a proposal and in 1995 the next one and after 5 years of discussion it was approved without any exceptions. There are items in this regulation that clarify who should be in an Organizing Committee, how to evaluate the results and to honour the winners. My role is to check how these rules are fulfilled and if there will be some violations I should tell about it. It's the first precondition of these competitions. I'm proud that they trust me.

Here in Moscow everything is perfect and at very high level from my point of view. It's extremely important for such great number of countries. Everybody must feel equal conditions at these competitions. Moscow is a very friendly, hospital and warm city for me even during my last coming in December 2006. In December of 2006 everything has been already prepared.

Best regards and good luck!

Maria Nefedieva

From Butlerov for you

"You should know that the nature chooses the ways that are right, but unhurried. We, sinners, should also study it. The opinion that hurry helps to save the time is absolutely false. Yesterday's laboratory exercises where I was looking after one of you prove these words. This gentleman hurried so much that decided to carry out two experiments at once. As a result he has caught on the test-tube by his sleeve and lost the substance he worked with. As usual the prize of the hurry was the necessity to start everything from the beginning".

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Magic ship and friendship











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Mendeleyev and Art

«From all signs distinguishing genius two are most significant: it is ability to cover and unite wide areas of knowledge and ability to produce unique sharp idea». This statement of the well-known Russian chemist L.Chugaev also concerns to the greatest chemist of the world Dmitry Ivanovich Mendeleyev who discovered the Periodic law of chemical elements in 1869.

This law could not be discovered with the knowledge that people had in 19th century. There were too many false facts and gaps. It is insight of the genius the capability to feel the great order in visible chaos of already known properties of substance. Incomprehensible ability of generalization in order, the ability to see universal simplicity of the law in endless variety, the mighty intuition pushing knowledge abroad the limits of known was needed.

But the man of genius is talented in all fields. Mendeleyev's interests were not limited to inorganic chemistry. Pedagogy, organic chemistry, petrochemical, metallurgical and coal industry, aeronautics, meteorology and metrology, biology and medical chemistry, agrochemistry and agriculture… Everywhere you can find Mendeleyev`s ideas. His recommendations still are used in criminalistics. «It's difficult to say what I haven't made during my scientific life, - wrote Mendeleyev. - And it was done not bad, I think ».

However, not many people know that D.I. Mendeleyev was a member of the Imperial academy of arts. No, he did not draw landscapes and still-lives. He was the center around whom the community of scientists and artists formed. These educated people regularly met on well-known Mendeleyev's Wednesdays. Why did Mendeleyev spend energy and time on it? He was convinced, that science and art are two key approaches to know the world and they are closely correlated. Therefore he considered that the dialogue between scientists and artists was important for development of science and art. In impression of A.I.Kuindzhi's picture « Night above Dnepr » (1880) the unexpected question arose in Mendeleev's mind: Did it accidentally the landscape as a genre of painting and the natural sciences as a science was appeared simultaneously in the beginning of the New time? He answered himself – it wasn't casual. During the Ancient times and Renaissance artists and philosophers studied a person, its soul and dialogue with God. With the starting of New time from Galilee epoch the understanding had come. It is impossible to study a person without relation with Nature. Whereas landscapes are representing Nature, natural sciences are investigating it. Mendeleev had detected close connection of natural sciences and arts. Really, only one year was needed for Michelson's experiments, 15 year for Rontgen's discoveries and 16 for discovery of radioactivity.

Use your brain

Why Rasputin was not poisoned with potassium cyanide?

Question. In 1916 in Saint Petersburg there was a famous murder – somebody shot Gregory Rasputin. But before shooting Prince Felix Jusupov tried to poison Rasputin with potassium cyanide. Poison has been thrust in cakes and port which Rasputin adored. He ate and drunk everything, but…has remained alive. Why so strong poison has not worked? May be Rasputin has used the magic?

Answer. The reason is not in magic. The plausible clue is in sugar. Potassium cyanide has been mixed in sweet cakes and port, containing glucose. Glucose as an aldehyde adds hydrogen cyanide forming nontoxic cyanohydrine:

$$RCH{=}O + HCN \rightarrow RCH(OH)CN$$

In other words, Rasputin was given poison together with an antipillbox, and cyanide was immediately inactivated, having entered in reaction with sugar. As you can see, the chemistry interferes not only in cookery, but also in history.

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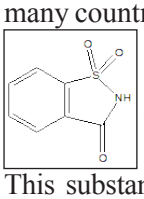
Best of the best

If to arrange a competition in the world of molecules it is possible to find the champions. Who are they, these champions? In each nomination there are leaders. Today we shall talk about sweet champions - about the sweetest substances.

The sweetest

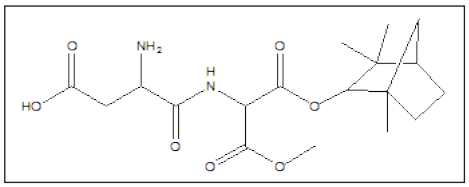
The sweetest of natural sugars is fructose. It is 1.7 times sweeter than saccharose . But it is not the champion. So, from berries *Dioscoreophylum cumminsi*, found in the jungle of Nigeria, we can find the substance which is 1500 times sweeter than sugar. Even more, 4 000 times, has surpassed saccharose taumatin fiber which was allocated from fruits of other African plant *Thaumatococcus danielli*. The small slice of taumatin can replace the whole bag of granulated sugar!

Sweet substances are searched in laboratories of many countries of the world. It is clear, that it is necessary to replace natural sugar with the low-calorie sweet substances that are harmless to diabetics. The first among them was saccharin - ortho-sulfobenzoic acid imide. This substance for the first time was synthesized by Americans A.Remsenom and K.Falbergom in 1878, is approximately 500 times sweeter than sugar. But there is serious lack in saccharin - it tastes bitter.



Aspartame is rather new synthetic sweet substance. It is dipeptide - N(-L-α-aspartyl)-L-phenylalanine methyl ether. It is 200 times sweeter than sugar and almost the same on taste. Besides it strengthens the taste of saccharose, glucose and saccharin, especially at presence of a citric acid. Small amounts of aspartame completely suppress unpleasant gustatory sensations which are caused by saccharin. In small intestines aspartame splits in two amino acids which it consists of. Harmless aspartame became one of the most popular substitutes of sugar.

The next "masterpiece of sweetness" has been created in 70th years when Japanese researchers synthesized dipeptide, constructed of the rests aspartic acid and aminomalonic acid (the last is taken in the form of a complex ether). Here is the structural formula of the sweetest of known substances, N(-L-α-aspartyl)-L-aminomalonic acid methylfenchylic ether. It is 33000 times sweeter than sugar!



Lessons in Russian

How are you? – Как дела? [kak dela]
Fine, thanks. – Спасибо, хорошо. [spasibo horosho]
What is your name? – Как тебя зовут? [kak tebja zovut]
My name is… - Меня зовут…[menja zovut]
Where are you from? – Откуда ты? [otkuda ti:]
How old are you? – Сколько тебе лет? [skolko tebe let]
What hobby do you have? – Какое у тебя хобби? [kakoie u tebja hobi]
To the left – Налево [nalevo]
To the right – Направо [napravo]
Forward – Вперед [vpered]
Back – Назад [nazad]
Up – Вверх [vverh]
Down – Вниз [vniz]
I love you - Я люблю тебя [ja lu:blu: tebja]

Call

Police - 02
Fire station and ambulance - 911

39th IChO office (for urgent calls only):
Alexander Gladilin +7 (916) 555 - 70 - 27
Vadim Eremin +7 (916) 611 - 88 - 90
Elena Eremina +7 (916) 133 - 00 - 55

Mentor Support:
Alexander Veresov +7 (910) 452 - 41 - 23

Student support:
Ekaterina Yakubovich +7 (916) 676 - 91 - 00

Guest support:
Alexandra (Shura) Prokhorova +7 (916) 587 - 60-26

Tomorrow program Thursday July 19th

7.45-8.30 Breakfast, Olimpiets

8.30-19.00 Whole-day excursion to Sergiev Posad, lunch included

19.00-21.00 Dinner, Olimpiets

The issue is prepared by:

Head of the project: Lukichev Alexander // Project managers: Salynkina Irina, Galieva Alina // Correspondents: Agaeva Aysel, Bredina Ekaterina, Davydova Katya, Eremina Maria, Kravtsova Anastasia, Pomerantseva Anna, Sabanova Alina, Nefedieva Maria // Correctors: Anna Berkovich, Sergey Sobolev, Yulia Valeeva // Photographer: Lobus Alexander // Designers: Turin Vadim, Lukichev Ilya
Published and printed by Trace light studio ltd
Call us: +7 (495) 939-26-66 // E-mail: luk-mail@mail.ru