catalyzer

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Thursday 11 July 2002

Issue no. 10

Journal for the 34th International Chemistry Olympiad | Groningen | The Netherlands | 5 - 14 July 2002

Theoretical Exam was difficult but doable

For the third morning in a row, all students had to get up early. This time, everyone could find his or her place in the examination hall fairly quickly. At twenty past nine, the envelopes could finally be ripped open. Several contestants would also like to have the original English version of the exam paper besides the text that had been translated for them. This caused some panic offstage. At around 1 p.m., some young ladies from Iceland and Kuwait were the first to leave the hall for good, after several hours of excitement. They felt the exam had not been too difficult.

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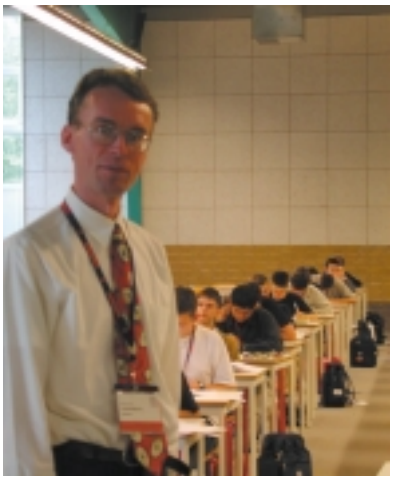
Stretching between questions

Unfortunately, they had been unable to answer several questions, but they still felt good about the exam. After that, the students gradually trickled out of the hall. They all agreed that the exam was doable, but also that it contained several difficult and unknown elements. Fortunately, their guides were there to take care of them!

Now it is the turn of the scientific committee to mark the solutions to their exam questions. All the students have to do now is relax and look forward to the closing ceremony!



Prof. Meijerink overseeing the theoretical exam

Prof. Andries Meijerink (Red Ruby), member of the scientific committee, about the theoretical exam:

"We have deliberately opted for short questions"

"The members of the scientific committee had been given the following task: create an interesting, relevant test appropriate to the level of Dutch first and second-year university students of Chemistry. When constructing the theoretical exam, we have tried to cover as wide an area as we could. Instead of five extensive questions, we have deliberately opted for ten relatively short questions ranging from biochemistry to physical chemistry. The exam will thus be interesting to all students. The

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No more white spots on chocolat

Who has never tasted the stale flavor of old chocolate, hard as rocks, lumpy, and covered in white spots? In the future, people may be spared this experience, since researchers of the NWO STW Technology Foundation working at the Laboratory for Crystallography of the University of Amsterdam — in cooperation with chocolate manufacturers — have come up with a method to prevent these white spots (caused by fat bloom) from being formed in chocolate. The method they have developed is also energy-efficient, space-saving, and applicable to large-scale manufacturing. A prototype machine is being developed. Chocolate threatens to become even more tasteful in the near future!

When you bite into a chocolate bar, what you basically do is crush cocoa butter crystals. The main ingredients of chocolate are cocoa butter, cocoa powder, and sugar. Cocoa butter crystallizes in six different crystalline phases (polymorphs). Each of these polymorphs has its own unique properties. Some are more stable than others, but the most stable form — required for chocolate of the highest quality — is the most difficult to obtain.
Fat bloom appears when unstable crystal cores are formed during the conventional chocolate manufacturing process. This happens when the hot chocolate mass cools to a temperature below 30 °C. These unstable crystal cores are only one thousandth of a millimeter in diameter. They will gradually turn into stable crystals. Sometimes this only occurs after several months. The transition is accompanied by the formation of the notorious white spots, the fat bloom. If the transition takes place after the production process (when the chocolate has been used in candy bars, confectionery, or chocolate letters), the quality of the final product will suffer. The fat bloom mainly develops when the chocolate is stored at too high temperatures.
Until now, chocolate manufacturers have used an energy-intensive method to convert the chocolate mass to its most stable form before using it in their final products. After all, the less unstable crystal cores in the chocolate mass, the less chance of fat bloom. To achieve this, they raise the temperature of the cooled chocolate again by several degrees, so that the unstable cores melt. This does not affect the stable cores that have already been formed. Then the chocolate mass is allowed to cool again. These steps are repeated several times. After this tempering process, the chocolate mass consists almost entirely of stable cores; however, the process usually does not eliminate all unstable cores. To improve the production process and the quality of the chocolate, the researchers have first tried to get a better understanding of the irreversible phase transitions of cocoa butter at the molecular level. Cocoa butter is a complex mixture of about thirty different triacylglyceroles (TAGs). TAGs are esters of glycerol with three long-chain fatty acids. Since each chain may differ in length and degree of saturation, there are many different TAGs. The hydrocarbon chains easily pack in different ways, which results in various polymorphs. The physical properties of TAG mixtures are largely determined by the properties of the individual TAGs in the mixture.

Separated

The new insights into the behavior of TAGs at the molecular level have enabled the researchers to come up with a better, more energy-efficient production process. The new process involves adding a stream of liquid chocolate containing only stable cores to a liquid chocolate mass (in which no cores have been formed yet). Cooling then creates a product with such a high percentage of stable cores that it is impossible for fat bloom to occur. Part of the not quite cooled mass is separated and fed back to the mixing tank. Since this component is slightly cooler, even more stable cores are created. Sufficient new stable cores are formed to maintain a continuous chocolate production process.
The Royal Dutch Academy of Sciences (KNAW) has awarded Dr Arjen van Langevelde the DOW Energy Prize for his thesis about this improved production process.

Tomorrow's program

Friday 12 July 2002

MENTORS / SCIENTIFIC OBSERVERS

From 06.00	Early breakfast at hotel
07:00	Departure for Groningen: hotels and Martini Plaza
08:00	Arbitration in Martini Plaza start first group
19:00	Dinner at Martini Plaza
20.00-24.00	Fourth Jury Meeting: Allocation of medals

STUDENTS

06:00	Early breakfast at hotel
07.30-22.00	Excursion to Amsterdam and surroundings

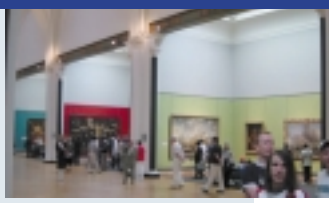
GUESTS

08:00	Breakfast at hotel
10:00	Departure for Groningen hotels
13.00-17.00	Excursion Groningen and surroundings

Trip to Amsterdam

While the IChO students were sweating over the theoretical exam, the mentors, observers, and guests went to Amsterdam. This meant an early breakfast, since it takes around 2.5 hours to get to Amsterdam from Friesland. The trip included an introduction to the Afsluitdijk, a boat tour through the Amsterdam canals, and visits to the Rijksmuseum and Science Museum Nemo. On the way back, dinner was served at a restaurant in Volendam, a picturesque fishing town on the shore of the IJsselmeer.
There was plenty to see and photograph, so that the home front will also be able to get at least a glimpse of the attractions: from stately mansions in the heart of Amsterdam to dike houses in Volendam, from Rembrandt and Van Gogh to Jan Steen.
All in all, it was an interesting trip; one the students will certainly also enjoy when they follow in the footsteps of their mentors on Friday.

The Amsterdam skyline



At the Rijksmuseum

The Rijksmuseum

Touring the canals

Science Museum Nemo

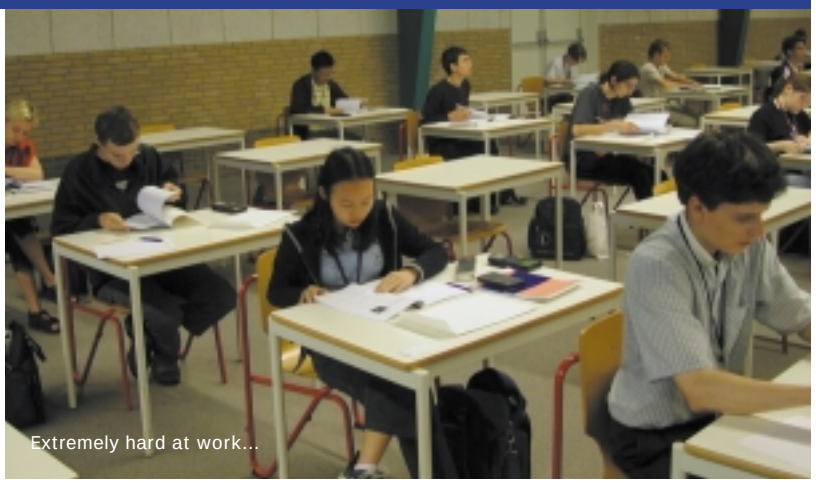
The Amsterdam skyline

120,000 photocopies

For each contestant, 5 photocopies of the practical exam paper and 12 of the theoretical exam paper have been made. In total, this adds up to no less than 120,000 (one hundred and twenty thousand) photocopies.
Undoubtedly, a fine example of the Greening of Chemistry.

>> Prof. Andries Meijerink

questions also require the students to display their insights into the subject matter rather than their computation skills.
The questions deal with four themes: Chemistry of Life, Chemistry of Industrial Relevance, Chemistry of Functional Molecules in Nature, and Chemistry Related to Light and Energy.
The members of the scientific committee have not only formulated the questions for the exams, they will also mark the exam papers. Although between them they know many languages, they certainly do not speak the languages of all participants, which posed a major limitation to the format of the questions. The questions had to be formulated in such a way that only numbers and diagrams need to be given as answers. A second examiner will also mark the questions, to corroborate the results of the first round. Finally, the mentors can comment on the final marking.



Extremely hard at work...

Incidentally, the reactions of the mentors to the exam questions were positive. They felt the exam was interesting and topical. The English was also considered to be good."

Are Frisians smarter than the other Dutch?

Jan Apotheker, chair of the 34th IChO, will make a statement to that effect in a show broadcast tonight by Omrop Fryslân, the Frisian radio and TV station. "Actually, the remark sort of slipped out before I knew it. But it is a fact that the number of Frisian participants is relatively high. The main reason for this is that Friesland has some highly dedicated Chemistry teachers who stimulate their students to participate. Particularly the Feitsma family — with 4 participants in various IChO's — has been highly successful. The youngest child in the family will participate next year, if he makes it through the Dutch qualifying round. Another Frisian participant, Arjen Cnossen, is the son of two Chemistry teachers, so what can you expect?"

Finnish competitor

WEDNESDAY 10 JULY: The students will really do anything to take the exams at all costs. A good example is Finnish competitor P. Valkama. He is presently afflicted by an allergic reaction to the Dutch weather. Add to that a sleepless night due to an asthma attack, and you will agree that these are not the best of circumstances for taking a theoretical test. Nevertheless, he is now doing exactly that. Hats off to him!

English version

WEDNESDAY 10 JULY: Although most aspects of this Chemistry Olympiad are met with great enthusiasm by all involved, it appears difficult to translate the exam questions satisfactorily. Many students therefore asked for a copy of the original English version.

What's on today's menu?

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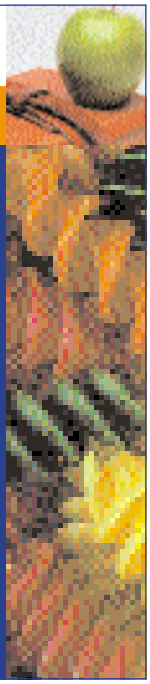

Dinner Buffet at It Wiid

- Greek tomato and bell pepper soup
- Chicken paté with berry sauce
- Salmon and dill salad
- Various types of breads with butter
- Osso bucco (veal stew)
- Ham off the bone with rosemary sauce
- Moussaka (Greek potato dish)
- Deep-fried Duchesse potatoes
- Grilled rib-eye steak with garlic
- Octopus rings
- Spare ribs
- Vegetarian dish of the day
- Italian cassata

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