



CATALYZER

Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND
NO. 1, JULY 29, 2016

Welcome Messages



On behalf of the organizing members of the 49th International Chemistry Olympiad, we would like to extend our warm welcome to all participants from every part of the world. As a host country for the Olympiad, Thailand will offer an exciting time and place from which a high-integrity competition can be achieved and many long-lasting friendships can be made. This year's theme for the Olympiad, "Bonding the World with Chemistry," reinforces a notion that "bonding" might just be what the world needs to meet all increasing demands and challenges.

Chemistry is deeply rooted in all walks of life. It is a common language shared by all nations and a foundation from which new knowledge and development are created. Thailand, a country of diverse cultures with a proud history, also benefits dearly from this science. An opportunity to host the Olympiad carries profound meanings to us; it not only represents a great honor for the host, but it also provides a means for global collaboration and paves the way for a progressive future, together.

We hope that the forthcoming Olympiad will be a rewarding experience for all participants. As the 49th International Chemistry Olympiad host, we pay attention to every detail to make sure that the academic competition proceeds fairly and with high standard. In addition to the competition itself, we hope that you use this experience to learn as much as you can from each other. The cities of Nakhon Pathom and Bangkok, where most activities will take place, will surely offer you fascinating perspectives and memorable experiences. So please enjoy your time here.

We look forward to welcoming you in Thailand very soon.

Warmest regards,

Mrs. Pornpun Waitayangkoon, Ph.D.
President of the 49th International Chemistry Olympiad
President of the Institute for the Promotion of Teaching
Science and Technology, Thailand



It is an honor to welcome you to the 49th International Chemistry Olympiad (IChO), which is the second time hosted by Thailand once again after the 31st IChO in 1999. The 49th IChO will be organized during July 6-15, 2017, at Salaya Center, the main campus of Mahidol University in Nakhon Pathom province located about 50 kilometers from Suvarnabhumi Airport. Salaya Center is the home for all freshman students of Mahidol University to study and enjoy their campus lives. With our pride, the opening and closing ceremonies will be held at Prince Mahidol Hall, which is one of the best auditoriums and the showpiece of the university. Hopefully, IChO, which is the exclusive academic competition challenging young talents from all over the world, will bring an opportunity to join our hands together as the global network and create the future of mankind. As the host of the 49th IChO, we wish you will enjoy the Olympiad as well as our Thai culture and hospitality.

Look forward to your participation

Assoc. Prof. Sittiwat Lertsiri, Ph.D.
Co-President of the 49th International Chemistry Olympiad
Dean of the Faculty of Science, Mahidol University





Kingdom of Thailand and the cities of Bangkok and Nakhon Pathom

The Reclining Buddha, Bangkok

Located in the South East Asia region, Thailand is a country with a subtropical climate rich in natural beauty, from mountain ranges in the northern part of the country to beautiful beaches in the south. Thailand has a population of over 65.7 million people made up of many ethnic groups having diverse religious beliefs living together in harmony in this "land of smiles."

Metropolitan Bangkok or "Krung Thep," the capital of Thailand, is located in the middle of the country and is home to more than 10 million people. Bangkok is full of interesting places worth visiting ranging from cultural attractions like the Grand Palace, the Temple of the Emerald Buddha, the Temple of Dawn, and Wat Pho (Temple of the Reclining Buddha), to arts and lifestyle destinations like museums and shopping complexes. The city also offers a wide selection of tasty Thai foods and international cuisines.

Nakhon Pathom is a nearby city, 56 kilometers west of Bangkok. The city is famous for fruit orchards, especially pomelo. Archeological and religious historical sites abound in Nakhon Pathom province. There are two major universities in this province: Mahidol University, Salaya campus and Silpakorn University, Sanam Chandra Palace campus.



Phra Pathom Chedi, Nakhon Pathom



Thai food



Floating market, Samut Songkhram



Similan Islands, Phang Nga



Koh Poda, Krabi



Mahidol University

Photograph by Silp Satjawattanavimol

Mahidol University

Mahidol University has a long and proud history of contributing to knowledge development in Thailand and is committed to research and teaching excellence. The establishment of Siriraj Hospital in 1888 by His Majesty King Chulalongkorn set the foundation for creation of the University of Medical Sciences in 1943, which was officially renamed as Mahidol University by His Majesty King Bhumibol Adulyadej in 1969. Since then, Mahidol University has gained a reputation as being one of the nation's most prestigious higher learning institutes, forging many global collaborative links to build on its core strengths in medicine, health, and science related areas and open new opportunities for innovation in research and higher learning. Today, Mahidol University encompasses 17 faculties, 6 colleges, 9 institutes, and 7 centers across 6 campuses: Phayathai and Bangkok Noi in Bangkok, Salaya in Nakhon Pathom, and regional campuses in Nakhon Sawan, Kanchanaburi, and Amnat Charoen.

Mahidol University's Salaya campus in Nakhon Pathom province, the venue for the 49th IChO, covers 520 acres of landscaped green area. Opened in 1982, it is a green campus with wide-open spaces ideal for exercise, team sports, games, and outdoor reflection to enhance the student experience. The newly opened Prince Mahidol Hall dominates the campus landscape, catering for cultural events, including free concerts. The Salaya campus is also situated close to many excellent Thai restaurants and areas to experience the uniqueness of Thai culture, such as Phuttamonthon (Buddhist park) and several floating markets to cater for shoppers!



Photograph by Naravut Suvannang

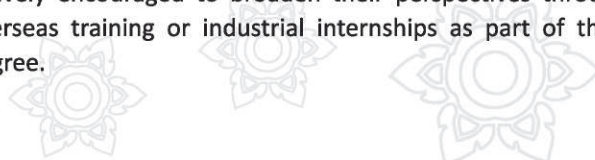
Department of Chemistry, Faculty of Science

The department was founded in 1958, the same year as the Faculty of Science. At present, the department is comprised of 42 faculty members having diverse research interests, from fundamental research to applied and multidisciplinary investigation in areas of organic chemistry, physical chemistry and chemical physics, inorganic chemistry and catalysis, analytical chemistry, and polymer science and technology. Underpinning the commitment to research excellence is the establishment of the Center of Excellence for Innovation in Chemistry (PERCH-CIC) and four capability units (Sustainable Energy and Green Materials, Surface Science and Engineering, Catalysis Science and Technology, and Inorganic and Materials Chemistry), which highlight the diversity of research being undertaken by the faculty staff.

The undergraduate programs in the Department of Chemistry are comprised of 4 years of study, with the practical nature



of chemistry ensuring that laboratory courses play an essential part of the curriculum. The international postgraduate programs (M.Sc. and Ph.D.) allow talented students to undertake research projects related to their interests while receiving training in advanced theory and techniques. As higher learning relates not only to obtaining but also applying knowledge to solve problems, students are actively encouraged to broaden their perspectives through overseas training or industrial internships as part of their degree.



Temple of Dawn, Bangkok

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Tentative Schedule

DATE		STUDENT	MENTOR & OBSERVER	GUEST
Thu, July 6	Whole day	Arrivals and Registration		
Fri, July 7	Morning	Opening Ceremony		
	Afternoon	Recreation/Excursion	Lab Inspection	Excursion
	Evening	Free Time	1 st Jury Meeting	
Sat, July 8	Whole day	Excursion/Lab Safety Instruction	Translation of Practical Exam	Excursion
Sun, July 9	Morning	Practical Exam	Excursion	Excursion
	Afternoon			
	Evening	Free Time	2 nd Jury Meeting	
Mon, July 10	Whole day	Excursion	Translation of Theoretical Exam	Excursion
Tue, July 11	Morning	Theoretical Exam	Excursion	
	Afternoon			
	Evening	Reunion Party		
Wed, July 12	Morning	Free Time	Grading the Exam	Excursion
	Afternoon			
	Evening		3 rd Jury Meeting	Free Time
Thu, July 13	Whole day	Free Time	Arbitration/4 th Jury Meeting	Free Time
Fri, July 14	Morning	Free Time		
	Afternoon	Closing Ceremony		
	Evening	Farewell Party		
Sat, July 15	Whole day	Departures		



Capital City	Bangkok
Competition Venue	Nakhon Pathom
Official Language	Thai
Area	
Total	513,000 km ² (51 st)
Water	2,230 km ²
Population	
In 2016	65,729,098 (20 th)
Density	133 persons/km ²
Currency	Baht (THB)
Time Zone	ICT (UTC+07)
	DST not observed

Today	Tonight	Tomorrow
Hi 32°	Lo 26°	Hi 31° Lo 26°

Catalyzer Team

Pasit Pakawatpanurut
Arada Chaiyanurakkul
Christopher B. Smith
Siwaporn M. Smith
Vuthichai Ervithayasuporn



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CATALYZER



Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND

NO. 2, JULY 7, 2017



Sukhothai Historical Park

The history of Thailand is dated back to the Neolithic civilization situated at the modern-day UNESCO World Heritage Site in Ban Chiang in the northeastern part of the country. Through many periods of proud civilizations and dynasties, Thailand today remains a strong sovereign nation united by King Maha Vajiralongkorn, or King Rama X of the Chakri Dynasty. The geography of Thailand ranges from landlocked northern and eastern provinces, to agricultural plains in the central region and magnificent seashores that border the Andaman Sea and the Gulf of Thailand. Although Thai people may look alike to many, different parts of the country can speak quite differently using distinct dialects. And even though about 93% of the population practice Theravada Buddhism, other religions such as Islam, Christianity, Hinduism, Confucianism, and Taoism are not uncommon. Perhaps it is this kind of tolerance toward others of different backgrounds that cultivates a sense of unmatched hospitality that the country is sometimes called the "Land of Smiles" – a place where "Bonding the World with Chemistry" can feel right at home.

The IChO

- The first IChO was held in Prague, Czechoslovakia, in 1968 with 18 participating students from 3 countries (Czechoslovakia, Poland, and Hungary)
- The first time Thailand participated in the IChO was in 1990 in Paris, France (22nd IChO)
- Thailand first hosted the IChO in 1999 in Bangkok (31st IChO)
- The 48th IChO was held in Tbilisi, Georgia, where 264 students from 67 countries took part in the contest
- The 49th IChO this year is in Nakhon Pathom, Thailand, with 297 students from 76 countries participating



A Temple in Bangkok



Songkran festival

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Sanam Chandra Palace: A Place to Visit in Nakhon Pathom



A direct translation in Thai language is "moon plaza," Sanam Chandra Palace was built and completed in 1911 by King Vajiravudh (King Rama VI) as a residential retreat during his trip to pay homage to Phra Pathom Chedi in Nakhon Pathom. After the reign of King Vajiravudh, the palace was closed and transformed to Nakhon Pathom's administrative area. At present, the palace belongs to the Bureau of the Royal Household and is open to the general public to visit. Sanam Chandra Palace is one of Thailand's historical sites that holds unique artistic and archeological value.

Getting to Know Each Other



Paphaphat Dissaneevate (nickname: Stamp), Thailand

"I feel a bit excited because this is the world competition and I think that holding this competition in Thailand is very lucky, because I know well about the weather and the areas and about the expectation from me. I try not to put any pressure on myself and I am convinced that I will do my best."



Percy Gonzalo Sifuentes Samanamud (nickname: Percy), Peru

"I have been very excited about this event. I think I can make many foreign friends here. When I arrived, the weather in Thailand was hot and humid. However, staff take care of us so well. The liaison meet us at the airport and always be here to take care of everything for us. She is willing to help us at all time. I am very impressed. I'm a little bit nervous because my English is not so well. It's quite difficult to communicate or make new friends."



Anamarija Nikoletić (nickname: Ami), Serbia

"I'm very excited about IChO2017. This is my first time as a participant, so everything is new to me. Other participants seem very friendly. I'm not sure what to expect, I'm proud to myself for qualifying to IChO. I hope I will represent my country in the best possible way both in knowledge and in socializing."



Saba Tavdgiridze (nickname: Saba), Georgia

"To be honest, I feel excited and a little nervous about upcoming IChO2017. After all, that is the event our team was preparing for whole year. However, this will not prevent us from enjoying Olympiad. Thailand, country of rich culture, gives us chances to explore whole new world. As a participant I hope to make friends from different countries and of course improve my last year performance."

Arrival of Delegates



Registration



Bonding the Elements into a Word

According to the periodic table given, each element is assigned with a score number. Your task is to construct a meaningful English word using only the symbols of the elements. Eight students who come up with words of highest scores will be rewarded with special gifts! As an example, the word "Ice" is formed by "I" + "Ce", which has a score of 1 + 4 = 5. Each student can submit only one word and may do so at anytime at <https://goo.gl/forms/DVvrE5yQbn3W3ESn1> from now until 13:00 of July 13, 2017. The winners will be announced at the Farewell Party. Enjoy!

1																	18																		
H hydrogen 4																	He helium 6																		
Li lithium 10																	B boron 4		C carbon 6		N nitrogen 3		O oxygen 10		F fluorine 5		Ne neon 9								
Na sodium 8																	Al aluminum 15		Si silicon 3		P phosphorus 2		S sulfur 3		Cl chlorine 4		Ar argon 14								
K potassium 7		Ca calcium 3		Sc scandium 13		Ti titanium 10		V vanadium 7		Cr chromium 5		Mn manganese 13		Fe iron 9		Co cobalt 5		Ni nickel 3		Cu copper 14		Zn zinc 16		Ga gallium 5		Ge germanium 9		As arsenic 4		Se selenium 8		Br bromine 15		Kr krypton 11	
Rb rubidium 17		Sr strontium 12		Y yttrium 2		Zr zirconium 20		Nb niobium 14		Mo molybdenum 5		Tc technetium 13		Ru ruthenium 6		Rh rhodium 5		Pd palladium 9		Ag silver 6		Cd cadmium 11		In indium 3		Sn tin 14		Sb antimony 16		Te tellurium 5		I iodine 1		Xe xenon 11	
Cs caesium 14		Ba barium 10		lanthanoids		Hf hafnium 18		Ta tantalum 9		W tungsten 5		Re rhenium 6		Os osmium 3		Ir iridium 7		Pt platinum 11		Au gold 6		Hg mercury 16		Tl thallium 18		Pb lead 14		Bi bismuth 4		Po polonium 2		At astatine 3		Rn radon 13	
Fr francium 9		Ra radium 8		actinoids		Rf rutherfordium 17		Db dubnium 14		Sg seaborgium 7		Bh bohrium 11		Hs hassium 4		Mt meitnerium 7		Ds darmstadtium 12		Rg roentgenium 15		Cn copernicium 16		Nh nihonium 18		Fl flerovium 3		Mc moscovium 4		Lv livermorium 14		Ts tennessine 9		Og oganesson 11	
La lanthanum 2		Ce cerium 4		Pr praseodymium 10		Nd neodymium 12		Pm promethium 17		Sm samarium 5		Eu europium 6		Gd gadolinium 17		Tb terbium 13		Dy dysprosium 3		Ho holmium 6		Er erbium 2		Tm thulium 18		Yb ytterbium 14		Lu lutetium 5							
Ac actinium 3		Th thorium 5		Pa protactinium 9		U uranium 2		Np neptunium 16		Pu plutonium 5		Am americium 2		Cm curium 14		Bk berkelium 10		Cf californium 20		Es einsteinium 4		Fm fermium 16		Md mendelevium 11		No nobelium 6		Lr lawrencium 16							

Thai Language

Thai language is a tonal language whose alphabet consists of 44 consonants, 18 vowels, and 4 tonal notations. Here are some useful words to get started.

Thai	Pronounced	English
สวัสดี	krub (M)/kha (F)	Hi
ขอบคุณ	krub (M)/kha (F)	Thank you
ขอโทษ	krub (M)/kha (F)	My apology/excuse me
ไม่เป็นไร	krub (M)/kha (F)	Don't worry
ยินดี	krub (M)/kha (F)	My pleasure/You're welcome

Schedule for July 8, 2017	
6:00	Breakfast
7:00	Transfer to the Royal Grand Palace
9:30	The Royal Grand Palace program
12:30	Transfer to Mahidol University, Salaya campus (lunch on the bus)
15:00	Lab safety and orientation
17:00	Transfer to Mida Dhavaravati Grande Hotel
18:30	Free time
19:00	Dinner



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Happy Birthday



Erzhibit Abdykerim Uulu,
Kyrgyzstan, July 6



José Diogo Costa Jesus,
Portugal, July 6

Catalyzer Team

Pasit Pakawatpanurut
Arada Chaianurakkul
Christopher B. Smith
Siwaporn M. Smith
Vuthichai Ervithayasuporn





CATALYZER



Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND
NO. 3, JULY 8, 2017

The Opening Ceremony of the 49th IChO



Professor I-Jy Chang
Chairman of the IChO Steering Committee

It is our great honor to have Your Royal Highness, Princess Maha Chakri Sirindhorn with us at the 49th International Chemistry Olympiad Opening Ceremony. I would also like to note that Her Royal Highness Princess Chulabhorn Mahidol, who is not here with us today, is a chemist, a Ph.D. and Professor in Chemistry, and is celebrating her 60th birthday this year. I would like to express our congratulations to her on this auspicious occasion.

The International Chemistry Olympiad competition is a unique event, which draws together young students with a common interest in chemistry from all over the world. For the next few days, you will be challenged to analyze and solve complex problems, in practical and theoretical exams and in creative and integrated ways. The theme for this year's competition is "Bonding the World with Chemistry." We are here, from all around the world, gathered in Thailand to make bonds with each other. This is one of the important goals of the IChO competition. For talented students like yourselves, making friends and forming strong bonds with each other is extremely important. The friendships you create during this event will lead to fruitful future collaborations and ultimately significant scientific contributions to the global community.

This year, we are delighted that the 49th International Chemistry Olympiad is held in Thailand. I would like to thank the Organizing Committee for taking on this huge responsibility, and providing a wonderful competition space. Besides the exciting challenges you will face over the next few days, Thailand is famous for its captivating culture, exceptional food, and excellent hospitality. I would like to urge everyone here to embrace these opportunities and to explore the wonders of Thailand.

Finally, to all the contestants, instructors, and other participants, do your best and enjoy your stay in Thailand. And once again, thank you, Your Royal Highness, for gracing us with your presence at the Opening Ceremony.



Dr. Pornpun Waitayangkoon

President of the Institute for the Promotion of Teaching Science and Technology (IPST)



On behalf of the Organizing Committee of the 49th International Chemistry Olympiad 2017, I would like to express my deep gratitude to Your Royal Highness for your gracious kindness to preside over today's Opening Ceremony and for the fullest support of both National and International Academic Olympiads. This event is particularly significant as it marks the auspicious occasion of the 60th birthday anniversary of Professor Dr. Her Royal Highness Princess Chulabhorn Mahidol.

Hosting International Olympiads is of considerable importance for our education system and this is the second time Thailand has hosted the International Chemistry Olympiad since 1999. The Organizing Committee, including personnel from five organizations, the Ministry of Education, Mahidol University, the Chemical Society of Thailand under the patronage of Professor Dr. Her Royal Highness Princess Chulabhorn Mahidol, the Promotion of Academic Olympiad and Development of Science Education Foundation under the patronage of Her Royal Highness Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra, and the Institute for the Promotion of Teaching Science and Technology (IPST), has made joint efforts to ensure a fair competition in this outstanding international event.



In addition, I would like to extend a hearty welcome to all participants to the 49th International Chemistry Olympiad 2017, organized mainly in Nakhon Pathom and Bangkok, Thailand. This year's competition lasts about ten days, from July the 6th to the 15th, and is welcoming a total of 297 students, 76 head mentors, 75 mentors, 58 observers, and 24 guests from 76 participating countries and 2 observing countries.

This remarkable event brings young talented people together from countries all over the world to compete in a friendly competition and provides them a unique opportunity to form meaningful relationships with one another. So, on behalf of the Organizing Committee, I hope this year's International Chemistry Olympiad fulfills these promises by challenging the contestants academically while developing a mutual understanding among different cultures and getting to know more about Thailand.

Thank you.



All Participants



Participating Delegations

▼ Argentina Armenia Australia Austria Azerbaijan Belarus Belgium Brazil Bulgaria Canada China Chinese Taipei Costa Rica Croatia Cuba Cyprus Czech Rep. Denmark El Salvador	▼ Estonia Finland France FYROM (Macedonia) Georgia Germany Greece Hungary Iceland India Indonesia Iran Ireland Israel Italy Japan Kazakhstan Korea Kyrgyzstan	▼ Latvia Lithuania Malaysia Mexico Moldova Mongolia Montenegro Netherlands New Zealand Norway Pakistan Peru Philippines Poland Portugal Romania Russian Federation Saudi Arabia Serbia	▼ Singapore Slovakia Slovenia South Africa Spain Sweden Switzerland Syria Tajikistan Thailand Turkey Turkmenistan Ukraine United Kingdom United States Uruguay Uzbekistan Venezuela Vietnam
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Observing Delegations

Luxembourg
United Arab Emirates

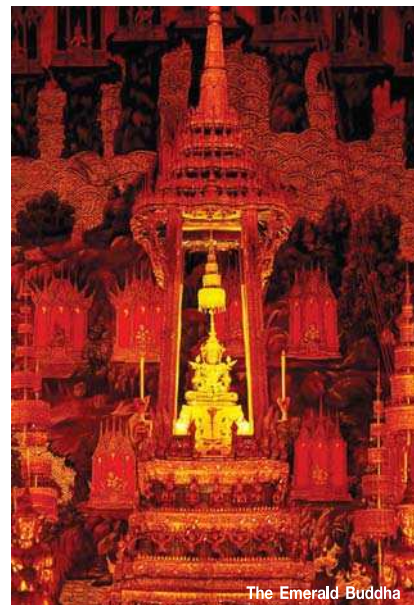
Royal Grand Palace

Temple, Royal Palace, Historical Sites, and Monuments

The Royal Grand Palace in Bangkok is probably the most visited landmark in Thailand. First constructed in 1782 during the reign of King Rama I of the Chakri Dynasty, the Royal Grand Palace is the center of architectural wonders and spiritual beliefs, where many of the country's most important ceremonies take place. One of the major attractions here is the Temple of the Emerald Buddha, which houses Thailand's most sacred Buddhist sculpture, Phra Kaeo Morakot (the Emerald Buddha carved from flawless green jade decorated with gold ornaments). To enter the Royal Grand Palace, visitors are strictly required to dress appropriately.



Royal Grand Palace



The Emerald Buddha

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Thai Language

Thai	Pronounced	English
วัด	wat	Temple
สวย, งดงาม	suay, ngod-ngarm	Beautiful, magnificent
สุภาพ	su-parb	Polite
ความปลอดภัย	kwam-plod-pai	Safety
ระวัง	ra-wung	Be careful



Statue of Kinnari

Schedule for July 9, 2017	
5:00	Breakfast
6:30	Transfer to Mahidol University, Salaya campus
8:00	Get ready for the Practical Exam
9:00	Practical Exam
14:00	Lunch
15:30	Transfer to Mida Dhavaravati Grande Hotel
17:00	Free time
19:00	Dinner

Today	Tonight	Tomorrow
Hi 32°C Lo 27°C	Lo 24°C	Hi 33°C Lo 25°C

Catalyzer Team

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ธนาคารกสิกรไทย
KASIKORN BANK





CATALYZER



Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND
NO. 4, JULY 9, 2017

Photos from the Excursion to the Royal Grand Palace

The Royal Grand Palace is one of the most popular tourist attractions in Thailand. The major attractions are the Temple of the Emerald Buddha and the elegant Chakri Maha Prasat Buildings, which is a blend of Thai traditional and European styles of architecture.



Photos from Lab Safety and Orientation

The purpose of lab safety and orientation is to give students awareness of general safety and introduce basic instructions of instruments that will be included in the practical exam.



Good to Know! Thai Etiquette when Visiting Thai Temples

1. Take off your shoes before entering the main hall.
2. Sit down inside the hall and do not point your feet toward the Buddha Statue, as feet are literally the lowest part of the body.
3. Be quiet and respectful to other people praying in the hall.
4. Be respectful to the monks. If you are a woman, you are not allowed to have physical contact with a monk.
5. Do not climb onto the Buddha Statue or take photo with inappropriate posture.

Get to Know Some Thai Foods

Rice: Thai people treat rice as a staple food and have it together with most dishes, like curries, stir-fries, Thai salads, etc. Thailand is the world's largest exporter of rice and there is more than one strain of Thai rice. Each of them has different flavors. Jasmine rice is the most famous type, and is indigenous to Thailand.



Tom yum kung: This is a world renowned Thai spicy soup with a soup base made from Thai herbs like lemongrass, galangal, lime leaf, and chili. Sometimes coconut milk is added to make the soup base richer. As "kung" means shrimp in Thai this is the meat type typically used in this dish, although you can also find Tom yum seafood that contains all kinds of seafood, not only shrimp.



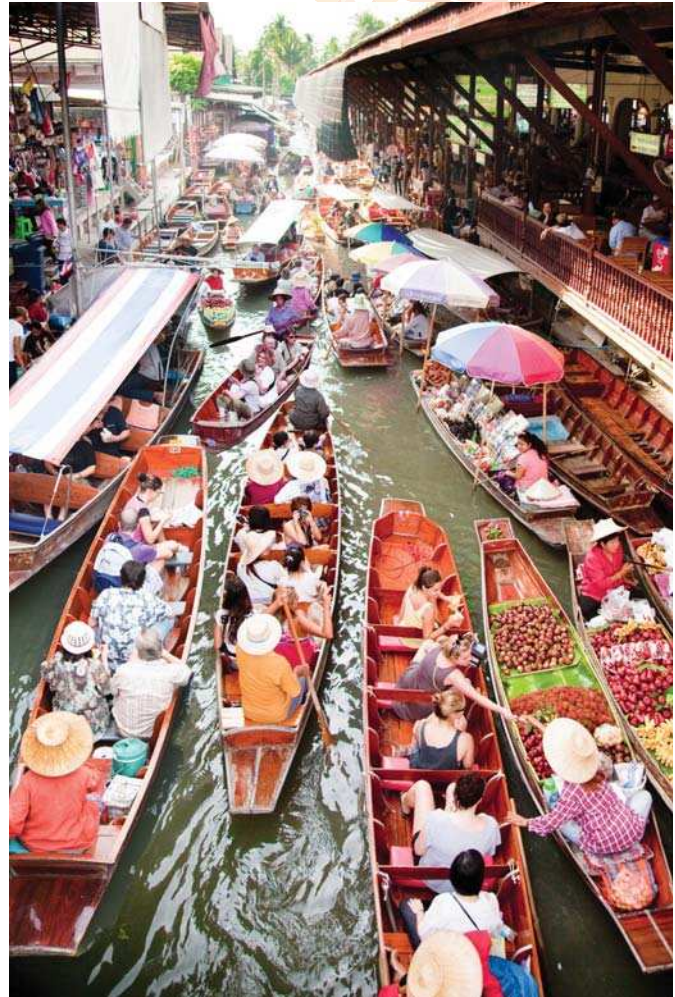
Pad-Thai: another famous Thai dish among foreigners. "Pad" means stir-fried, so Pad Thai means Thai style fried noodles. It contains rice noodles, fresh shrimp, dried shrimp, egg, tofu and bean sprouts and is seasoned with tamarind sauce and fish sauce.



Attractions for July 10, 2017

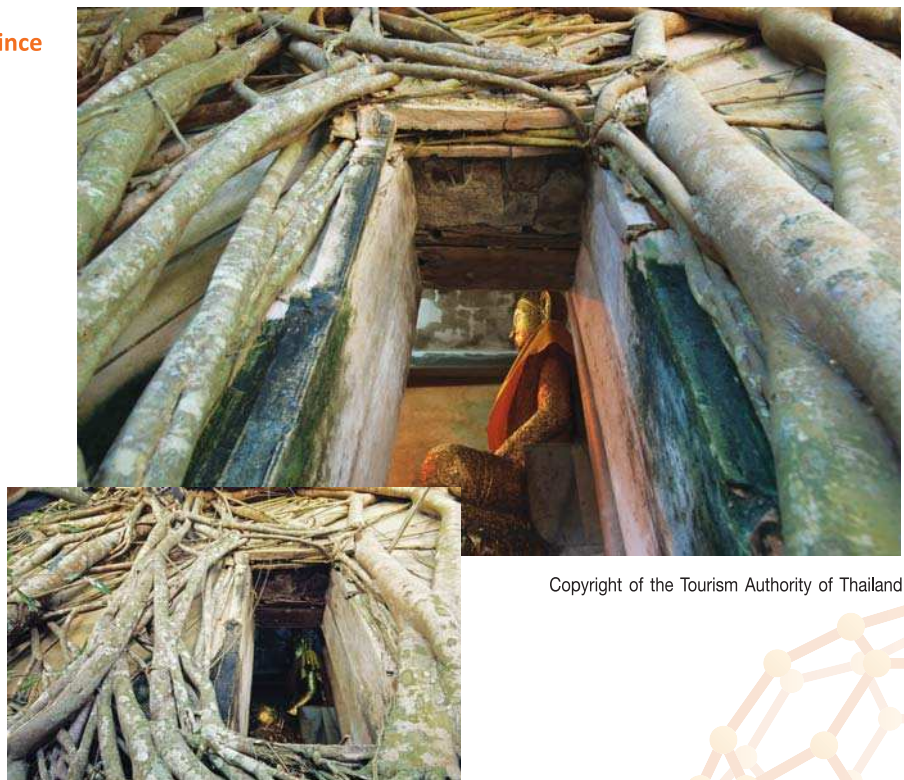
Damnoen Saduak Floating Market, Ratchaburi Province

In the past, Bangkok was called "Venice of the East" because the river and canal network throughout the city served as the means of transport and people usually used rowboats for travel. Nowadays, as roads are the major means of transport it is quite difficult to find a floating market in Bangkok. However, in Ratchaburi province, which is not far from Bangkok, there is a large floating market called "Damnoen Saduak Floating Market." This floating market is one of the most famous attractions in Thailand. It is open everyday from 6am until noon and you can find a variety of fruits and vegetables grown in this area, and sold by the boat vendors. Visitors can also take a ride on a rowboat to experience the atmosphere of the market and the way of living by the river.



Bang Kung Camp, Samut Songkhram Province

After the second defeat of the Ayutthaya kingdom (previous Thai kingdom before the present Rattanakosin Kingdom) in 1767, King Taksin the Great relocated his navy to this campsite. Wat Bang Kung, which was built during that time, served as the spiritual and physical center of the camp. A year later, after Ayutthaya kingdom was reclaimed, this campsite was left unused for almost 200 years until the Ministry of Education built a shrine to memorialize King Taksin the Great's achievements. It contains an ordination hall built in the Ayutthaya period, which now covered with lush ficus trees, in the camp compound.



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King Rama II Memorial Park

King Rama II was the second king of the Chakri dynasty of the Rattanakosin Kingdom of Thailand (the present king is King Rama X). King Rama II made many contributions to the arts and culture of Thailand, and was awarded the status of "Person of the World" by UNESCO.

This memorial park is built to honor King Rama II, and his achievements in Thai arts and culture are displayed in this compound. There is also a King Rama II museum, composed of four buildings housing artifacts from the early Ratanakosin era and King Rama II's household furniture, and showcases the way of living of Thai people during that time.



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Thai Language

Thai	Pronounced	English
ข้าว	khaw	Rice
เผ็ด	ped	Spicy
กุ้ง	kung	Shrimp
หิวข้าว	hiw khaw	Hungry
กินข้าว	kin khaw	Having meal (rice)

Today	Tonight	Tomorrow
		
Hi 32°C	Lo 26°C	Hi 32°C Lo 26°C

Catalyzer Team

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Christopher B. Smith
Siwaporn M. Smith
Vuthichai Ervithayasuporn

Schedule for July 10, 2017

5.30	Breakfast
6.30	Transfer to Damnoen Saduak Floating Market
11.00	Lunch
12.00	Transfer to Bang Kung Camp
14.30	Transfer to King Rama II Memorial Park
16.30	Transfer to Mida Dhavaravati Grande Hotel
18.00	Free Time
19.00	Dinner

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ธนาคารกสิกรไทย
开泰银行 KASIKORNBANK



CATALYZER

Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND
NO. 5, JULY 10, 2017

Atmosphere of the Practical Exam

The Practical Exam was held at Faculty of Science building, Mahidol University, Salaya Campus.



Get to Know Some Thai Foods



Durian: Known as the "king of fruits" among people in Southeast Asia. While it is a tropical fruit native to Southeast Asia but not native to Thailand, Thailand is currently one of the major exporters of durians and there are over 300 named varieties. Many people find durian to have an unpleasant odor, although, some people like durian so much that this is no concern! The yellow flesh can be eaten at various stages of ripeness and it is normally eaten fresh or with sweet sticky rice. Nowadays, you can also find blocks of durian paste, durian chips, durian candy, durian ice-cream and even freeze-dried durian in the markets.



Mangosteen: A round and dark purple fruit, mangosteen is also a tropical fruit grown mainly in Southeast Asia and India. Only the white flesh inside is edible, being juicy and having a sweet taste. In Thailand, mangosteen is often eaten together with durian. Even though mangosteens are exported, it is often difficult to get fresh mangosteen in some countries; when available it is usually very expensive. So, if you can, try some while you are here, as Thailand is heaven for fruits lovers!

Mango: Mango is a tropical fruit, native to South Asia. However, Thai mangoes are a little different from those of other South Asian countries. There are many strains of Thai mangoes and most of them have an aroma, and sweet taste. Unripe mangoes are also eaten in Thailand, sometimes with the salt, sugar and chili, or fish sauce and dried shrimp dipping sauce.



Mango and Sticky Rice: This is a famous seasonal Thai dessert. Ripe Thai mango is served with sweet sticky rice topped with coconut sauce. It is available only at certain times of the year so make sure you try it! You will love it!

Get to Know Thai Culture: Thai Boxing



Thai Boxing or Muay Thai has been a part of Thai history since the Ayutthaya period. Muay Thai was predominantly used for self-defense by Thai warriors in the past. The legendary Nai Khanom Dtom made Muay Thai famous in his battle against a group of Burmese by taking them on one by one: a battering and bruising contest. Later on, Muay Thai was codified with rules and regulations, and introduced as a sport. These days, Muay Thai has become a fitness regimen for many people, and training gyms can be found almost everywhere in the country. With its long history, Muay Thai is now recognized throughout the world, attracting many foreigners to visit Thailand in order to experience it at its origin.



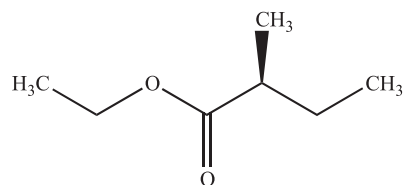
Muay Thai Lesson



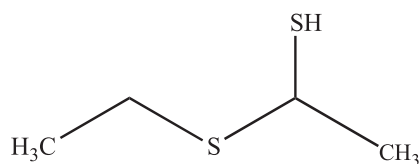
Chemistry behind the Notorious Odor of Durian

Most people who have tried durian either love it or hate it. What are the chemicals behind its strong odor? Researchers have isolated sixteen compounds from durian pulp, however, only two compounds, namely ethyl (2S)-2-methylbutanoate, and 1-(ethylsulfanyl)ethane-1-thiol, are responsible for the characteristic smell of durian pulp.

For further reading, see: Li, J.X., Schieberle, P. and Steinhaus, M. Insights into the Key Compounds of Durian (*Durio zibethinus* L. "Monthong") Pulp Odor by Odorant Quantitation and Aroma Simulation Experiments. *J. Agric. Food Chem.*, **2017**, 65, 639-647. <http://pubs.acs.org/doi/pdf/10.1021/acs.jafc.6b05299>



Ethyl (2S)-2-methylbutanoate



1-(Ethylsulfanyl)ethane-1-thiol



Thai Language

Thai	Pronounced	English
ร้อน	ruan	Hot (weather, food)
น้ำ	nam	Water
หวาน	hwan	Sweet
เปรี้ยว	priyaw	Sour
อร่อย	a-ro	Delicious
ทุเรียน	thu-reiyn	Durian
มะม่วง	ma-muang	Mango
ข้าวเหนียว	khaw-niyw	Sticky Rice

Today	Tonight	Tomorrow
Hi 33°C	Lo 26°C	Hi 33°C Lo 26°C

Catalyzer Team

Pasit Pakawatpanurut
Arada Chaianurakkul
Christopher B. Smith
Siwaporn M. Smith
Vuthichai Ervithayasuporn

Schedule for July 11, 2017

5.30	Breakfast
6.30	Transfer to Mahidol University
8.00	Get ready for Exam
9.00	Theoretical Exam (Siriwittaya building)
14.00	Lunch
16.00	Dow Chemical Talk (L2-101)
18.00	Reunion Party
21.00	Transfer to Mida Dhavaravati Grande Hotel

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Happy Birthday

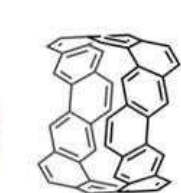
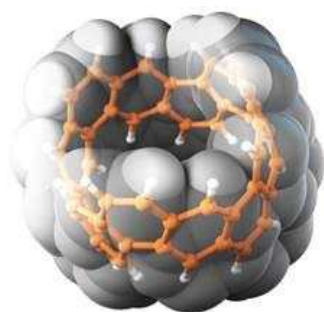


Sigurður Guðni Gunnarsson,
Iceland, July 10

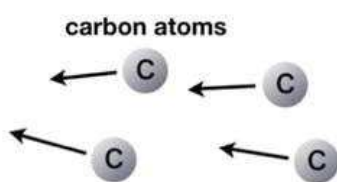




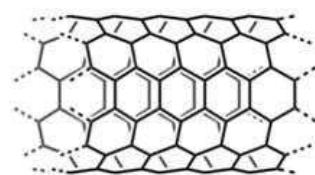
WORLD CHEMISTRY: Let's make a carbon nanobelt



Carbon nanobelt



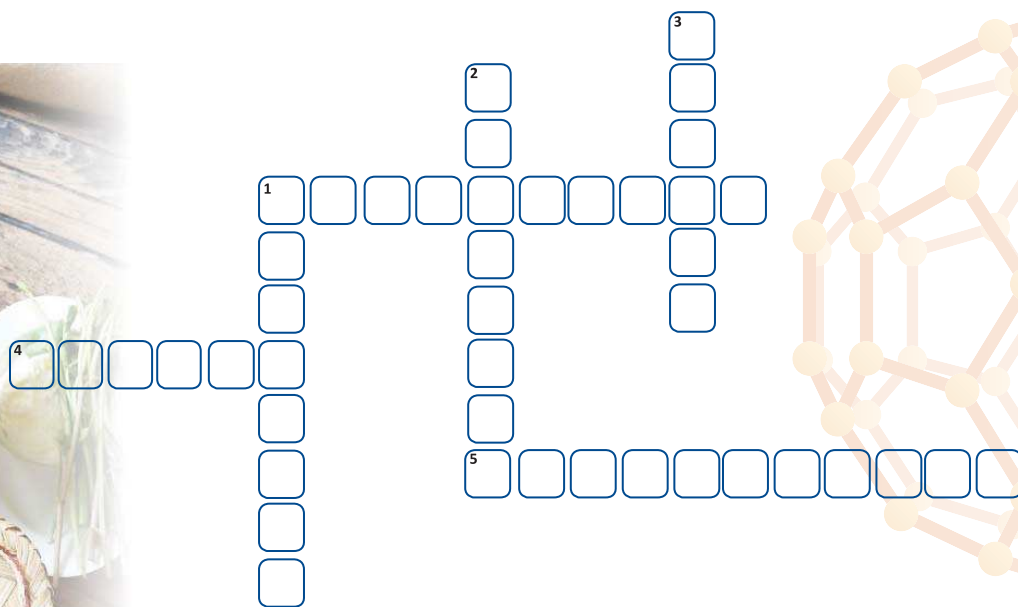
Growth
----->



Carbon nanotube

Current synthetic methodologies produce carbon nanotubes with inconsistent diameters and lengths, which changes their electrical and optical properties. This makes it extremely difficult to isolate and purify a single carbon nanotube that having a specific diameter, length and sidewall structure. In 2017, a **Carbon nanobelt**, measuring 0.83 nanometer (nm) in diameter, was successfully developed by researchers at Nagoya University, although scientists around the world have tried to prepare carbon nanobelts since the 1950s. Carbon nanobelts are belt-shaped molecules composed of fused aromatic benzene rings, which are six-membered rings consisting of six carbon atoms. Carbon nanobelts are a segment of carbon nanotubes and can be used as a nanobuilding block to control the structures of carbon nanotubes, which have various applications in electronics and photonics due to their unique physical characteristics. Therefore, being able to precisely control the synthesis of structurally uniform carbon nanotubes will help develop novel and highly functional materials. (Science **2017**, DOI: 10.1126/science.aam8158).

QUICK CROSSWORDS



- 1a. The research institute in Thailand with the same name as the Thai princess who is a chemist (10)
- 1b. With their presence, reactions occur faster. (8)
2. It is black in color. Apart from being used as electrode, it is commonly found in stationery shops. (8)
3. A mineral composed mainly of silicon. When synthesized, it usually has high level of UV transmission. (6)
4. The main ingredient in Som-tum, a popular Thai salad. (6)
5. A process that occurs when molecules escape from the liquid to the gaseous state. (11)

FLOATING MARKET: Let's float to the future!

Check out the photos from early morning of Chemistry Olympiad students taking a chance to ride on a row boat, getting the sense of the real floating market!



THAI TRADITIONAL COSTUMES: Let's dress together!



When Queen Sirikit accompanied King Bhumibhol Adulyadej (Rama IX) on state visits to Europe and the United States in 1960, King Bhumibhol noted that there was a need for a modern national costume suitable for formal wear. The queen then researched historical records of royal dresses, and eight official designs were then developed and promoted by the queen herself, and her aides. These designs are called Ruean Ton, Chit Lada, Amarin, Borom Bhiman, Chakkri, Dusit, Chakkrabhat and Siwalai Thai dresses accordingly. Since then, the use of these dresses has become more mainstream. Yesterday afternoon, Chemistry Olympiad students dressed in Thai traditional costume, called Thai "Payook" dress, to get a taste of real Thai culture at the King Rama II Memorial Park, Samut Songkhram Province.



Crossword solutions
1a) Chulabhorn
1b) Catalyst
2) Graphite
3) Quartz
4) Papaya
5) Evaporation

Thai Cuisine: Curries

Sharing food is commonly done in Thai meals, where several dishes are placed in the middle of the table for sharing among friends and family members. At least one spicy dish is usually present, along with other milder foods to give a variety of flavors. The spicy dish could be either chilli dip (served with raw or cooked vegetables), spicy salad (possibly containing meat), or curry. All participants should take the chance to enjoy some of these tasty curries during their stay in Thailand.

Green curry (Kaeng-Kheaw-Waan): This coconut milk based curry can be made with various meat types (beef, chicken, pork, or prawn). Egg plants and basil leaves are also added. The green color comes from using curry paste made with fresh green chilies.

Red curry (Kaeng-Ped): Made by cooking coconut milk with red curry paste containing roasted dried red chilies, galangal, lemon grass, kaffir lime peel, and shrimp paste. Meat (chicken, beef, roasted duck, prawn), egg plants and basil leaves are typically added.

Panang curry (Kaeng-Pa-nang): Panang curry paste is quite similar to red curry paste, with additional caraway seeds and coriander seeds. The curry is usually made slightly sweet (using coconut sugar) with shredded kaffir lime leaves placed on top, and without vegetables.

Som curry (Kaeng-Som): Squeezed tamarind juice is the main ingredient for this curry as well as curry paste made of roasted dried chilies, shrimp paste, shallots and other herbs. Coconut milk is not required, and the soup is orange. Fish or prawn, as well as mixed vegetables are common ingredients. In the southern region, locals add cumin giving the curry a yellowish color.



Jungle curry (Kaeng-Paa): This very hot dish has no coconut milk. Generally, meat will be stir fried with curry paste (containing minced garlic, fresh bird-eye chili and strong flavored herbal roots), followed by addition of water.

Massaman curry: Ranked 1st in the World's 50 best foods (CNN, 2011), Massaman curry is slightly sweet with a unique aroma (from caraway seed, cardamom, cinnamon, cloves, star anise, and bay leaves). Adding peanuts makes Massaman curry different from other Thai coconut based curries.



Today	Tonight	Tomorrow
Hi 34°C	Lo 26°C	Hi 33°C Lo 26°C

Catalyzer Team

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Christopher B. Smith
Siwaporn M. Smith
Vuthichai Ervithayasuporn

Schedule for July 12, 2017

5.00	Breakfast
6.30	Excursion to Ayutthaya (Lunch)
16.30	Transfer to Hotel
19.00	Dinner

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Happy Birthday



Zhengkai Huang
China, July 11, 1999





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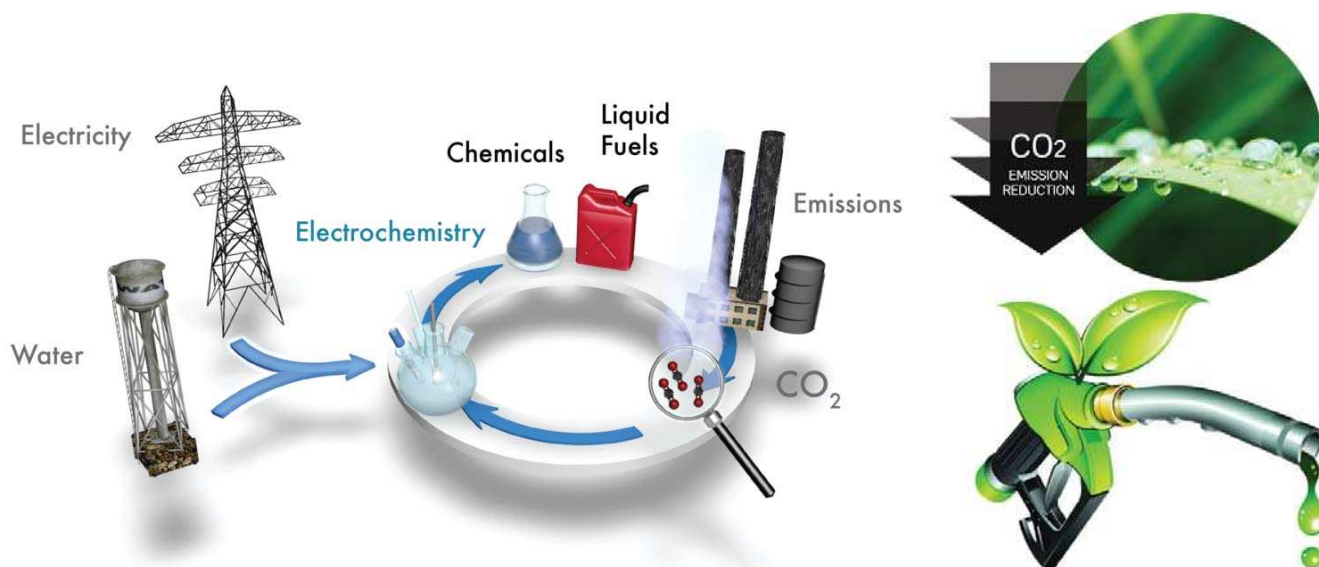


Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND

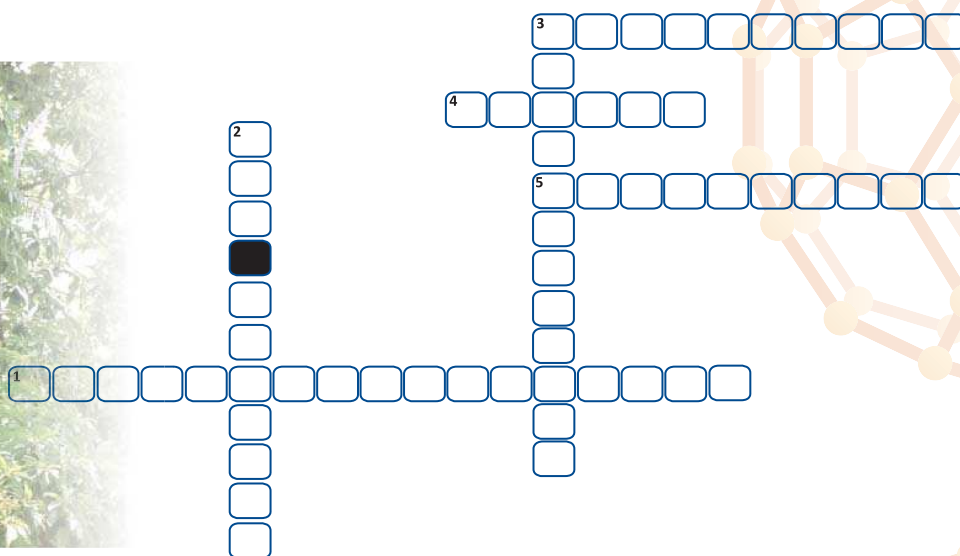
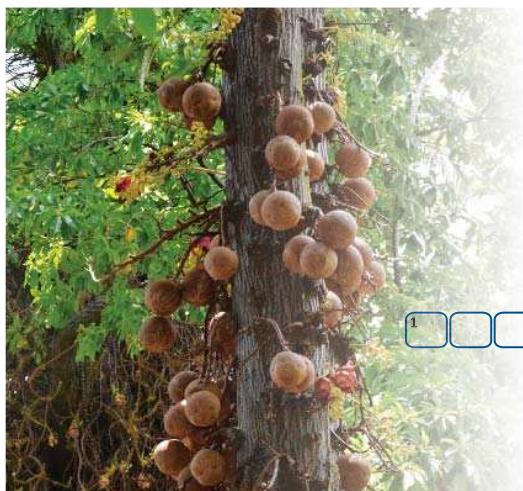
NO. 7, JULY 12, 2017

WORLD CHEMISTRY: Ethanol from water and carbon dioxide!



Most cars in Thailand are able to run on a blend of 80 percent gasoline and 20 percent ethanol, called gasohol "E20". In Thailand, ethanol is an alternative source of energy and renewable fuel made primarily from fermented Molasses, Cassava, and Cane Juice. To produce the almost 4 million liters of ethanol consumed daily by Thai drivers requires a huge amount of farmland. A better way would be to produce it from carbon dioxide directly, but this is technically difficult. A recent discovery (2017) of a copper catalyst by Stanford University scientists could lead to a new, more sustainable way to make ethanol without sugar or other biomass. This promising technology has three basic components: water, carbon dioxide and electricity delivered through a copper catalyst. (Proceedings of the National Academy of Sciences **2017**; DOI: 10.1073/pnas.1618935114).

QUICK CROSSWORDS



1. This property is highest for the fluorine atom (17)
2. One of the 2016 Nobel Laureates in Chemistry (3,7)
3. Name of a tropical tree having beautiful flowers and woody, spherical fruits up to 20 cm in diameter. These trees are generally planted in Thai Buddhist Temples. (10)
3. Process where gas changes to liquid (12)
4. A type of glassware used in filtration (6)
5. The role of egg in mayonnaise (10)

Theoretical Examination: So Serious!



Broadening Knowledge with Dow Chemicals!



Atmosphere of Reunion Party





Nine Thai Good Luck Desserts



Thai desserts (Kha-nom or Kanom) can be categorized based on their main ingredients. The sweetness may come from cane, coconut, or toddy palm sugar, or from other ingredients. Tapioca, corn and rice flours, and eggs may be used to afford desserts having different flavors and textures. Nine Thai sweets are 'must have' components in important cultural events such as weddings and merit making ceremonies. Nine in Thai is pronounced 'Kao', having the good meaning 'walking forward', which is symbolic of a successful move or auspicious future. Tong is the Thai word for gold.

- 1) **Tong Yord** or Golden drops, are made of egg yolk cooked in sugar syrup (Meaning: continuous wealth)
- 2) **Tong Yip** or Pinched Gold Egg Yolks (Meaning: touch of wealth)
- 3) **Tong Ek** or Carved Egg Yolk Tart adorned with gold leaf (Meaning: the top, the best)
- 4) **Foï Tong** or Gold Threads, made of egg yolk cooked in sugar syrup (Meaning: longevity, eternal love)
- 5) **Cha Mongkut** or crown shaped tart made of egg yolk, flour, and coconut (Meaning: owner of the crown or the top position)
- 6) **Med Kanoon** or bean paste coated egg yolk cooked in sugar syrup (Meaning: Full of support)
- 7) **Sanay Chan** or Flour Paste Chan fruit (Meaning: Receiver of love, Charming)
- 8) **Kanom Chun** or Steamed layer rice cake (Meaning: Work promotion or better life)
- 9) **Look Chub** or ground mung beans (with skins removed) in sugar, coconut cream, clear gelatin, and food coloring (Meaning: A kindness, especially from senior)

Crossword solutions

1) Electronegativity 2) Ben Feringa 3) Cannonball, Condensation 4) Funnel 5) Emulsifier

Ayutthaya: The Second Capital City of the Siamese Kingdom

Founded in 1350, and flourishing from the 14th to the 18th centuries, Ayutthaya was strategically located on an island surrounded by three rivers connecting the city to the sea. The location was chosen to avoid seasonal flooding and to protect the city from invasion. Nevertheless, the city was attacked and destroyed by the Burmese army in 1767. The city is now an archaeological ruin, with the unique remains of prangs (reliquary towers), Chedis (conical shaped stupa), city walls, and Buddhist monasteries of monumental proportions, giving an idea of the city's past size and its magnificent architecture. Ayutthaya was included on the list of UNESCO World Heritage Sites in 1991. Excursion sites include Mahathad Temple, Prasrisanpetch Temple, Panead Klong Chang, and Wat Chaiwattanaram.



Panead Klong Chang



Wat Chaiwattanaram



Wat Phra Si Sanphet

Schedule for July 13, 2017

5.00	Breakfast
7.30	Excursion to PlukRak Farm
13.00	Lunch
14.00	Excursion to Rattankosin Pottery
17.00	Transfer to Hotel
19.00	Dinner

Today	Tonight	Tomorrow
 HI 33°C Lo 26°C	 Lo 26°C	 HI 33°C Lo 26°C

Catalyzer Team

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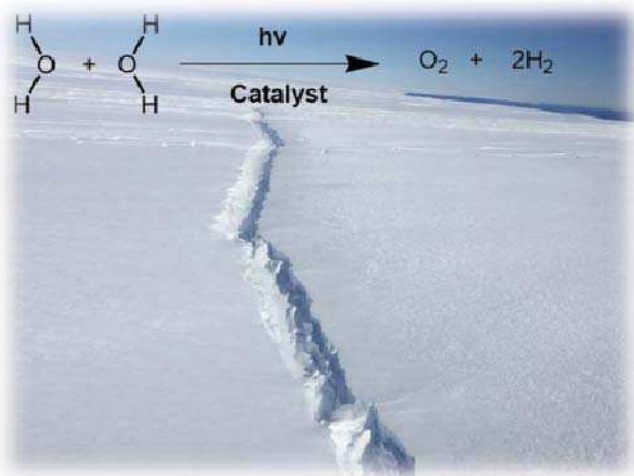
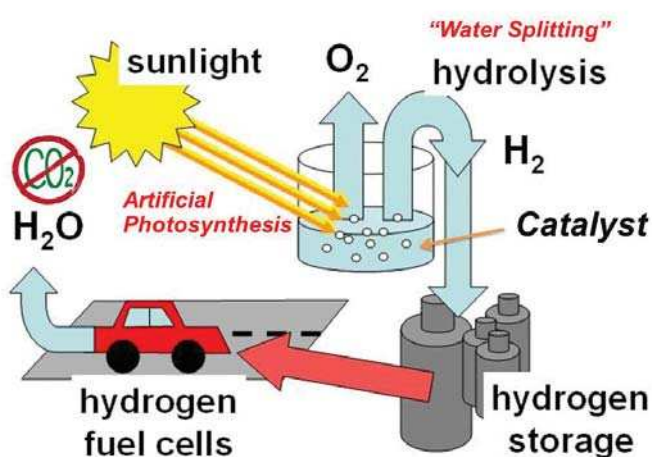
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Bonding the World with Chemistry

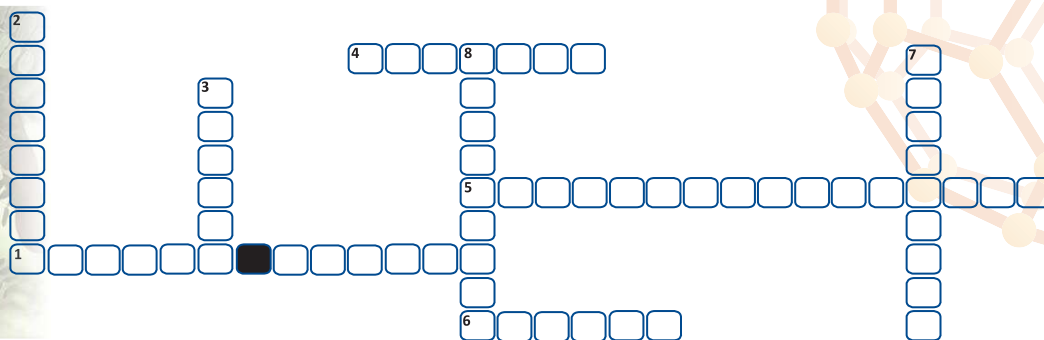
49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND
NO. 8, JULY 13, 2017

WORLD CHEMISTRY: Cracking Water!



Global climate change and energy crises mean that alternatives to fossil fuels are urgently needed. Among the cleanest low-carbon fuels is hydrogen, which can react with oxygen to release energy, emitting nothing more harmful than water (H_2O) as the product. However, most hydrogen on Earth is already locked into H_2O (or other molecules), and cannot be used for power. Hydrogen can be generated by splitting H_2O , but this uses more energy than the produced hydrogen can give back. Water splitting is often driven by solar power, so-called "solar-to-hydrogen" conversion. Materials like titanium oxide, known as semiconductors having a wide band-gap, are traditionally used to photocatalytically convert sunlight to chemical energy. However, these materials are inefficient because only the ultraviolet (UV) part of light is absorbed: energy from the rest of the spectrum is wasted. Now, a team at Osaka University has developed a material able to harvest a broader spectrum of sunlight. (Angewandte Chemie International Edition **2017**, DOI: 10.1002/anie.201612315).

QUICK CROSSWORDS



1. A quantity related to molecular polarity. The greater the difference in the electronegativity of 2 atoms relates to a higher value (6,6)
2. A key ingredient giving sourness in Pad-thai, a popular stir-fried rice noodle dish (8)
3. A hydrocarbon compound containing 8 carbon atoms, with the number relating to the anti-knocking property of gasoline (6)
4. A raw material used extensively in computer and solar panel production (7)
5. Scientist who studies the arrangement of atoms and molecules in solids (16)
6. An elastomeric material (6)
7. Non-crystalline state (9)
8. A substance used in titrations that changes color with pH (9)

How Many Temples are There in Ayutthaya?

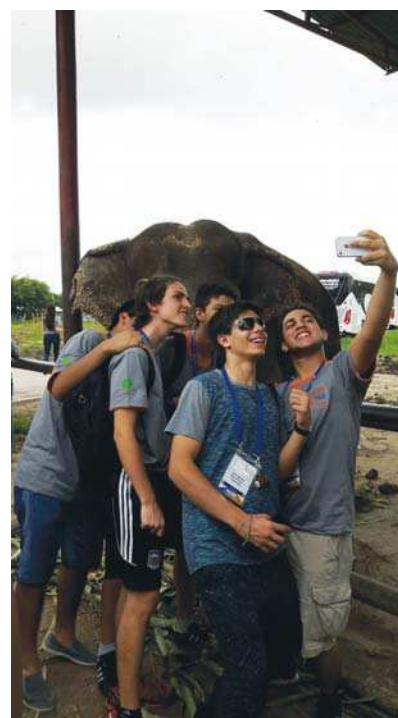
A former capital in ancient times, Ayutthaya boasts some of the most historically important temples outside Bangkok. The ancient ruins of Ayutthaya feature a range of architectural styles, including Khmer and Burmese influences, while some of the newer structures display Western features. Some of the more important temples in the area, and definite highlights for a visit to Ayutthaya, include Wat Phra Si San Phet, Wat Chaiwatthanaram, and Wat Yai Chai Mongkol.





Exploring "Panead Klong Chang" in Ayutthaya!

In the Ayutthaya period, this was the place where elephants paraded in front of the monarch. The King of Ayutthaya was actively involved in selecting elephants for his service. Such elephants were used to transport aristocratic families on terrestrial journeys, and in the same way as tanks in bringing troops into battle. White elephants were considered the exclusive property of the King in the past, and this practice continues even today, with these animals afforded utmost respect and dignity.



Crossword solutions

1)Dipole Moment 2)Tamarind 3)Octane 4)Silicon 5)Crystalllographer 6)Rubber 7)Amorphous 8)Indicator



"Jai" means heart. Here are some short terms expressing the character or feelings of Thai people.

Jai-Dee (Good hearted): Kind or caring

Jai-Yen-Yen: An expression meaning "calm down!"

Hen-Jai (Seeing heart): Showing that you understand and care about someone's troubles

Kreng-Jai (Caring heart): Unwilling to push oneself onto others or to cause inconvenience

Jai-Nak-Leng (Mafia's heart): Easy to make big decisions regardless of consequences

Jai-Rawn (Hot hearted): Easy to get angry or hot tempered

Jai-Dum (Black heart), **Jai-Rai** (Evil heart), **Jai-Hin** (Rock heart): Unkind, or unwilling to share

Noi-Jai (Having a small heart): Being upset about something and not wanting to speak with anyone

Jai-Loi (Floated heart): Getting carried away, or being unable to concentrate

Jai-On (Malleable heart): Accepting someone's requests even though these could cause inconvenience or problems later



Catalyzer Team

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Schedule for July 14, 2017

5.00	Breakfast
9.00	Transfer to Mahidol University
10.30	Lunch
11.30	Closing Ceremony (Prince Mahidol Hall)
17.00	Farewell Party (Siriwittaya Building)
21.00	Transfer to Hotel

Happy Birthday



Benjamin Muntz
Denmark, July 13



Oscar Blommegård
Sweden, July 13

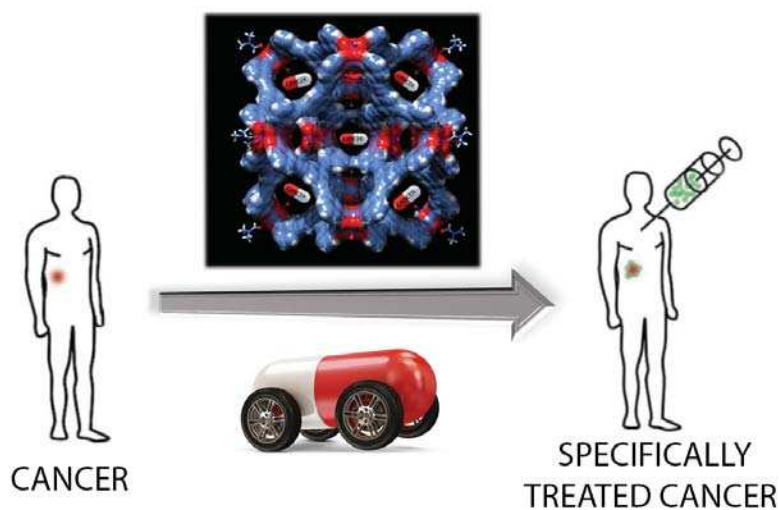
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Giant Molecular Cages for Energy Conversion and Drug Delivery

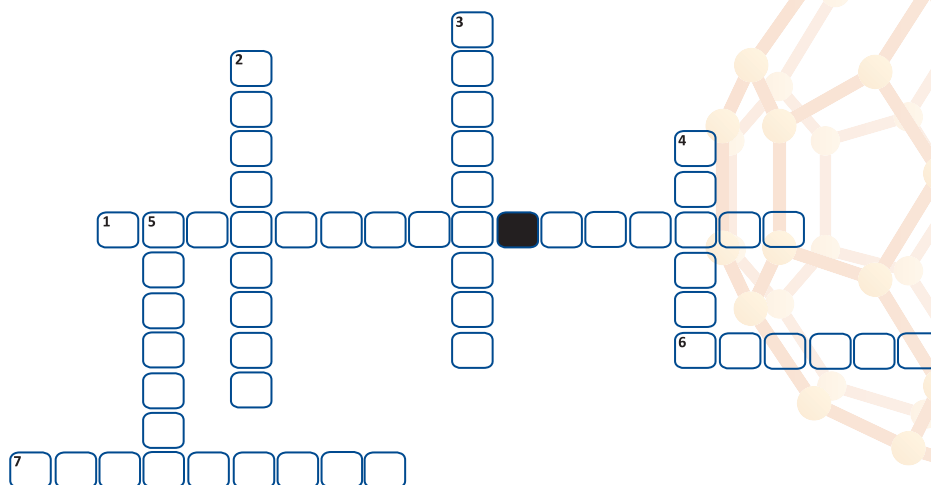


Scientists from Trinity College Dublin, Ireland, have created 'molecular cages' that can maximize the efficiency of chemical conversions, and may also be used as sensors or drug-delivery agents in the future. The cages can be packed with different guest molecules, many of which have a specific task or functionality. Incredibly, a teaspoon of powdered cage provides a greater internal surface area than that of an entire football field (4000 m²/g)! The idea of packing inside the cages is to ensure these molecules are delivered to a target, or to bring them close enough together to react in a specific way. For example, a drug could be encapsulated in one of these "metal-organic polyhedra" (MOP) with the knowledge that it would only be released at the specific target site. The researchers also hope to develop light-active porous metal-organic materials for use in "green energy", by creating a molecule that can convert light to useful forms of energy, essentially replicating the way plants produce energy via photosynthesis. (Nature Communications **2017**, DOI: 10.1038/ncomms15268).

QUICK CROSSWORDS



Tnews.com



1. A hot research topic exploring alternatives to petroleum fuel. (9,6)
2. Heavy hydrogen atom. (9)
3. A yellow Autobot and a fictional character from the Transformers movies. (9)
4. Thailand's king of fruits, love it or hate it! (6)
5. A gemstone that embodies the principal Thai Buddha image at Wat Phra Kaew, the temple next to the Grand Palace, Bangkok. (7)
6. An acid, when decomposed, results in nitrogen oxides which are responsible for air pollution. (6)
7. A type of laboratory glassware used in distillation experiments. (9)



Pluk Rak Farm

This farm, which holds an Organic Agriculture Certification, provides fun activities to promote learning about sustainable agriculture. Examples of such activities are Insect Walk & Art, Organic Toys, Salad Dressing Workshop, Salted Egg Workshop, Organic Tea time, and Organic Tea Compost displays.





Fun Excursion Trips: Feedback



Dhyey Sankalp Gandhi, India

Hello!

I liked the excursion trip to the farm (Pluk Ruk Farm) the most. I love those baby chickens and I also loved to do lots of activities that I never usually get to do like farming and making small puppets from grass. Also, I like Thai cooking with egg (salted egg), which is new item for me. We experienced Thai culture here. It was very nice!



Charles Jerome Reyes, The Philippines

Sa-wad-dee-khrub!

For me, the excursion trip at Rai Pluk Rak (Pluk Ruk Farm) is the best, because I think that the presentation there was very interactive. It is very fun interacting in farming lessons with other people (other participants). With Thailand being an agricultural country, it is fun to experience first-hand how the economy works. Kob-khun-khrub (Thank you!)



Janice Ho, New Zealand

There were many fun times at the floating market as we were so immersed in Thai culture. The boat ride was exciting and we saw many coconut trees and traditional houses on the way there. We also learnt how to bargain with the shopkeepers and get things less expensive than normal.



Sofía Medina Guarino, Uruguay

I really like the Royal Grand Palace because of the meaning it has here in Thailand. There are such beautiful buildings. They are so ancient and awesome. Even though the day was crowded I enjoyed it as this is something we cannot see every day. In our country, we can't see this kind of thing. I really liked it and enjoyed it!



Santiago González Crepsac, Venezuela

I loved the excursion to the Royal Grand Palace because I love to see Thai architecture. I also really like to understand how religion affected the way the temple was constructed. I really would love to learn more Thai history regarding religious matters.

Crossword solutions

1)Renewable Energy 2)Deuterium 3)Bumblebee 4)Durian 5)Emerald 6)Nitric 7)Condenser

UNSEEN THAILAND: Recommended List

Thailand is one of the dream destinations for visitors that want to enjoy beautiful scenery and landscapes, as well as experiencing local culture. Here are some recommendations for your next Thailand visit, which we hope will be very soon!



Heo Narok Waterfall, Khao Yai National Park, Prachinburi
Three-tier waterfall in a well-protected national park and UNESCO World Heritage site



Phu Hin Rong Kla National Park, Pitsanulok
Unique landscapes exhibiting bizarre rock formations



Doi Monjong, Chiangmai
Beautiful mountain ranges and scenery, and the site of the Omkoi Wildlife Sanctuary



Mon Bridge, Mon Tribal Village, Sangkhlaburi, Kanchanaburi
Thailand's longest wooden bridge and the second longest in the world, measuring over 400 meters long



Teelorsu Waterfall, Tak
A spectacular waterfall having a width of 5 football fields connected together, and a height of 200-300 meters



Similan Island, Phang Nga
One of the most spectacular destinations globally for Scuba Diving and Snorkeling

Copyright of the Tourism Authority of Thailand

Schedule for July 15, 2017

6.00	Breakfast
8.00	Departure

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ธนาคารกสิกรไทย
KASIKORNBANK



Catalyzer Team

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Christopher B. Smith
Siwaporn M. Smith
Vuthichai Ervithayasuporn

Happy Birthday



Ernesto Picón Montenegro
Argentina, July 14



Gregor Drelichowska
Austria, July 14



CATALYZER



Bonding the World with Chemistry

49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND
NO. 10, JULY 15, 2017

The Closing Ceremony of the 49th IChO



Clinical Professor Udom Kachintorn
President of Mahidol University

Mahidol University is proud to be part of the 49th International Chemistry Olympiad and to witness student achievement through hard work, strong determination, and a sense of purpose.

The university is named after His Royal Highness Prince Mahidol of Songkla, who is the father of the late His Majesty King Bhumibol Adulyadej. Through selfless dedication and many pioneering works, His Royal Highness Prince Mahidol of Songkla is revered as Father of Modern Medicine and Public Health in Thailand.

His Royal Highness once remarked, "True success is not in the learning, but in its application to the benefit of mankind." This wisdom of His Royal Highness, together with the university's motto: "Do unto others as you would have others do unto you" is the message I would like to share with you today.

This competition is certainly one of the defining moments in life as you have worked very hard earning a spot here to represent your country. I would like to congratulate the winners for your remarkable achievement and congratulate each and every one of you, contestants, for completing this competition. Your talents, knowledge, and diligence will most certainly guarantee success at whichever path you choose. Along the way, I hope you always be kind to others and use your talents to benefit the society as a whole. Please remember that the 2017 IChO is not an end in itself but rather an important stepping stone towards a higher purpose in life.

I, on the behalf of Mahidol University and the Organizing staff, wish you all a bright future and we look forward to seeing your positive contributions to the world in years to come.



Associate Professor Sittiwat Lertsiri
Dean of the Faculty of Science, Mahidol University

On the behalf of Mahidol University, I would like to thank the Organizing Committee, the Institution for the Promotion of Teaching Science and Technology (IPST), the Chemical Society of Thailand under the patronage of Dr. Her Royal Highness Princess Chulabhorn Mahidol, Ministry of Education, the Promotion of Academic Olympiad and Development of Science Education Foundation under the Patronage of Her Royal Highness Princess Vadhana Krom Luang Naradhiwas Rajanagarindra for their tireless efforts in making this event a successful and unforgettable experience for students and all participants involved. This year, the 49th International Chemistry Olympiad held in Thailand has welcomed a total of 297 students, 76 head mentors, 75 mentors, 58 observers, and 24 guests from 76 participating countries and 2 observing countries, which is by far the largest number of participants for any International Chemistry Olympiads.

Over the past 9 days, our young contestants have had a chance to create lasting friendships through various activities and also intensively participate in both practical and theoretical exams. During these exams, their knowledge, creativity and analytical skills were tested and carefully evaluated. The awards are given based on the results of their overall performances. In this regard, I would like to congratulate the winners on their accomplishments. As for those who do not receive a medal today, don't get discouraged. Winning is a milestone but success is a continuing process. Both winning and setbacks are integral components of success. In this sense, everyone here has made a significant progress and should be proud of themselves.

Finally, as this year's International Chemistry Olympiad is coming to a close, I, on the behalf of Mahidol University and the Organizing Committee, would like to reiterate that it is our great honor to host the prestigious 49th International Chemistry Olympiad 2017. We hope that all participants, contestants, mentors, observers, and guests will bring home lasting bonds and memorable and positive experiences of this Olympiad and Thailand.

Thank you.



Professor I-Jy Chang
Chairman of the IChO Steering Committee

Nine days ago, we gathered here and wondered what would happen in the 49th International Chemistry Olympiad. Today, we realize that it was full of challenge and excitements.

The intense competition is completed. For those of you whom you don't think you have done a good job, well, you are wrong, you did a great job. You have studied very hard to get you here. And in here you have participated in all activities that the Organizing Committee arranged for you. Through those activities, you make friends and form strong bonds with each other. These friendships are the true assets you will benefit forever.

For the students going home with a shining medal. I congratulate you and hope you enjoy this sweet moment. I also like to remind you that there are more and bigger challenges in Chemistry. We have great expectation from you. Work hard and work together to solve the problems that we are facing. I am sure very soon you will make significant contributions to the global community.

On behalf of the IChO Steering Committee, I'd like to thank the Scientific Committee for providing challenging exams and being flexible to adapt many last minute requirements from the International Jury.

Members of the Scientific Committee, would you please stand up and accept our sincere appreciation.

I also want to thank the Organizing Committee for working so hard and planning this successful event in such detailed precisions that it ran as smooth as silk.

Members of the Organizing Committee, would you please stand up and accept our sincere appreciation.

Finally, I thank Thailand for endless wonders and extremely friendly people.

Thank you all.



Assoc. Prof. Pinit Ratananukul
Chairman of the Scientific Committee

On behalf of the Scientific Committee, it has been our great honor to be a part of the 49th International Chemistry Olympiad competition 2017. Our goal is to provide stimulating and engaging environments, which promote both academic excellence and meaningful friendships among our young contestants. As for the exams, we have included thought-provoking experiments as well as intellectual challenges for the students. Based on the performances, I would like to compliment our young contestants for their intellect, perseverance, and creativity, which are clearly displayed during this competition.

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I would like to congratulate all participants for their accomplishment. On behalf of the scientific committee, I hope all participants have gained invaluable experiences and lasting memories from this Olympiad.

This competition would not be possible without great dedication from all members of the Scientific Committee. We are also grateful to the International Steering Committee for their assistance in organizing this event. Last but not least, excellent preparation, hard work, and fair play from all mentors and participants have undoubtedly made this event successful and memorable.

We hope this past week has been inspiring and we encourage everyone to pursue your passion for learning and creating, which will be of great benefits to our society.

Thank you.





Professor Jung-II Jin
Former IUPAC President

I am highly honored to represent the International Union of Pure and Applied Chemistry, IUPAC, for this very important event. Unfortunately, the president of IUPAC, Prof. Natalia Tarasova, could not join you because she has to chair the GA and International Chemical Congress being held right now in San Paolo, Brazil. She wishes to convey her best regards to all of you.

First of all, I would like to express my heart-felt congratulations to all medalists and the rest of student participants. You are the best of best hopes for our future. We hear everyday about the arrival of the age of the 4th Industrial Revolution. I strongly believe that in the next industrial revolution, the chemistry knowledge will play a central role for providing indispensable technological bases of the revolution. As I wrote several years ago when I was the IUPAC president, we are about to experience another Renaissance of Chemistry in the 21st Century.

Ladies and Gentlemen, I fully understand what it takes to organize such an international event as this Olympiad. I am deeply thankful to the organizing committee members, supporting and sponsoring organizations and Mahidol University for their year-long hard work in the preparation of and also for all the success of this Olympiad. I am very thankful to organizers for their hospitality as well. My special best wishes should go to all the participating students. And I wish you all grow up to become responsible and creative chemists who can provide right answers to many challenging development, providing a common language for chemistry, and advocating the free exchange of scientific information.

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I wish you all the best and thank you for your kind attention. Khaawp Khoon Khrap (thank you).



The Farewell Party

If the announcement of medals felt a little tense to some people, it was the farewell party that surely relaxed all minds. Aside from all the fun and the entertainment, the party was an opportunity for friendships that would only strengthen with time.



The Top 3 Gold Medalists



Congratulations to every student who participated in the 49th IChO, and particularly to the top 3 gold medalists: (from left to right) the second gold medalist Yuan-Chen Yeh of Chinese Taipei, the first gold medalist Alexander Zhigalin of Russian Federation, and the third gold medalist Amirabbas Kazeminia of Iran.

The Takeaway

Alexander Zhigalin, Russian Federation

"With this IChO, I persuaded myself that if you really want something, you are always going to achieve it, if you really want something, of course. And the IChO showed me that it is possible to get to the place you want to get, and there's nothing impossible of doing things. And I think that this feeling will follow me for my whole life."

Yuan-Chen Yeh of Chinese Taipei

"I think the most valuable thing I get from participating IChO is that I can make many friends from different countries. I can learn cultures and listen to many stories in just a few days. The friendship we build up these days will definitely be the fortune in the future!"

Amirabbas Kazeminia, Iran

"It was a fantastic trip for me to be able to represent my country in international platform. It was good to get involved in many cultural activities being done by the students from different countries. Overall, it was a marvelous journey for me!"

Thai Language

Thai	Pronounced	English
ยินดีที่ได้รู้จักครับ (M)/ค่ะ (F)	yin-dee-tee-dai-roo-jakkrub (M)/ka (F)	Nice to know you
แล้วเจอกันใหม่ครับ(M)/ค่ะ (F)	laew-jur-gun-maikrub (M)/ka (F)	See you again
ไปแล้วนะครับ (M)/ค่ะ (F)	pai-laew-nakrub (M)/ka (F)	Bye-bye
เดินทางโดยสวัสดิภาพครับ (M)/ค่ะ (F)	dern-tarn-duay-sa-wad-di-parpkrub (M)/ka (F)	Have a safe trip

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49TH INTERNATIONAL CHEMISTRY OLYMPIAD, THAILAND

NO. 11, JULY 16, 2017

AWARD RESULTS



Congratulations!

On Your
Achievements

Gold Medal



Alexander Zhigalin	Russian Federation
Yuan-Chen Yeh	Chinese Taipei
Amirabbas Kazeminia	Iran
Huan Lin	China
Harrison Wang	United States
Chung-Yueh Yuan	Chinese Taipei
Zhengkai Huang	China
Hanjun Lee	Korea
Hieu Dinh	Vietnam
Anton Morgunov	Kazakhstan
Wei-Yu Lin	Chinese Taipei
Zhiyun Lei	China
Matthias Liao Yi Quan	Singapore
Amir Hossein Behnoudh	Iran
Ruslan Kotlyarov	Russian Federation
Joshua Park	United States
Keum Ah Kwak	Korea
Paphaphat Dissaneevate	Thailand
Petar Hristov	Bulgaria
Keiya Sakabe	Japan
Lam Nguyen	Vietnam
Anh Pham	Vietnam
Tung-Hua Fang	Chinese Taipei
Parsa Pirooz	Iran
Paul Haidu-Gerea	Romania
Varit Chantranuwathana	Thailand
Andrés Fabian Salinas	Peru
Steven Liu	United States
Tze King Lam	Singapore
Rokas Elijosius	Lithuania
Ramil Babazade	Azerbaijan
Brendan Yap	United States
Ceylan Ceylan	Turkey
Dean Fanggohans	Indonesia
Irin Ghosh	India
Alexandra Dima	Romania

Silver Medal



Ilija Srpak	Croatia
Ekaterina Zhigileva	Russian Federation
Shuku Morita	Japan
Ron Solan	Israel
Josef Tomeček	Czech Republic
Michał Pychtin	Poland
Kensei Yagiu	Japan

Yile Chen	China
Apisara Kaweyanun	Thailand
Tuyen Hoang	Vietnam
Yimian Tang	Singapore
Zhiyuan Zhang	Singapore
Jaehyun Kim	Korea
Yuki Amabe	Japan
Filippo Bigi	Italy
Minghao Zhang	United Kingdom
Jun Won Son	Korea
Fahmi Rizki	Indonesia
Soroush Baniani	Iran
Bader Almulhim	Saudi Arabia
Dhanekula Varun Chowdary	India
Dhyey Sankalp Gandhi	India
Ivan Hou	Australia
Palina Bulauskaya	Belarus
Matyas Sajgo	Hungary
Légia Toscano de Melo	Brazil
Muhammad Setiyawan	Indonesia
Vid Kermelj	Slovenia
Daniel Golec	Poland
Tan Jun Hao	Malaysia
Mykola Avramenko	Ukraine
Kirill Kozlov	Russian Federation
Yuliia Fil	Ukraine
Anthony Lim	United Kingdom
Ivna de Gomes	Brazil
Pranav Ramakrishnan	India
Richard Veselý	Czech Republic
Nariman Mirishov	Azerbaijan
Joao Victor Pimentel	Brazil
Justas Mikutavicius	Lithuania
Anamaria Leonescu	Romania
Soma Turi	Hungary
Borna Simic	Croatia
Hermish Mehta	Canada
Mario Lorenzo	Indonesia
Sahil Baid	United Kingdom
Péter Pál Kalapos	Hungary
Bence Béla Botlik	Hungary
Carel Kuusk	Estonia
Aliaksei Harakhouski	Belarus
Taras Sekh	Ukraine
Andrea Rogolino	Italy
Dorian Gabriel Muntean	Romania
Aliaksei Kharlap	Belarus
Damjan Čubraković	Serbia
Zijun Hui	New Zealand
Bowornthai Boonrak	Thailand
Brandon Lee	Australia
Jiří Ledvinka	Czech Republic
Matteo Castagnola	Italy
Leonard Atzl	Austria
Chiril Solovei	Moldova
Meshal Bahammam	Saudi Arabia
Jakub Narodowicz	Poland
Martin Rihtaršič	Slovenia

Bronze Medal



Gregor Drelichowska	Austria
Anamarija Nikoletić	Serbia
Margarita Fomenko	Latvia
Edvinas Alisauskas	Lithuania
Aziz Tursunmuratovich	Uzbekistan
Joonsuk Kang	United Kingdom
Raman Mazur	Belarus
Andrej Kukuruzar	Serbia
Vladislavs Aščeulovs	Latvia
Milidu Ratnayake	New Zealand
Mario Esteban Gonzalez Vasquez	Costa Rica
Sangheon Yeom	New Zealand
Batuhan Apa	Turkey
Martin Orságh	Slovakia
Dumitru Mitcov	Moldova
Rina Sevostianov	Israel
Saba Tavdgiridze	Georgia
Wojciech Jankowski	Poland
Jeffrey Zhou	Canada
Stefan Schmid	Austria
Jože Gašperlin	Slovenia
Nurassyl Serik	Kazakhstan
Emīls Azanda	Latvia
Abdulrahman Aledrees	Saudi Arabia
Tomás Suleiman	Argentina
Alexei Torgashov	Germany
Miroslava Novoveská	Czech Republic
Xincheng Miao	Germany
Mukhsumov Xursand ogli	Uzbekistan
Yohan Fis	France
Sinem Seleme Övünç	Turkey
Ali Alasmari	Saudi Arabia
Sebastian Koelbl	Austria
Celso Renan Lima	Brazil
Benjamin Muntz	Denmark
Krastyo Draginov	Bulgaria
Dylan Siow-Lee	Australia
Suvdanchimeg Sunderiya	Mongolia
Intizar Tashov	Turkmenistan
Mathieu Beauvillain	France
Tamam Hawa	Syria
Oleksandr Kolomiiets	Ukraine
Janice Ho	New Zealand
Joshua Sims	France
Assem Zhunis	Kazakhstan
Spartak Saghyan	Armenia
Ömer Faruk Bıçer	Turkey
Inomjon Majidov	Tajikistan
Daniil Soloviev	Netherlands
Michael Hong	Ireland
Tomi Ruosteoja	Finland
Vesela Mehandzhieva	Bulgaria
Efstratios Tsakalidis	Greece
Kristina Kostadinova	Bulgaria
Alban Simonnot	France
Abdukhakimov Nodirbek ogli	Uzbekistan
Filip Trajkovski	FYROM

Diarmuid O'Donoghue	Ireland
Ernesto Picón Montenegro	Argentina
Alicia Huntley	Ireland
Serdar Begenjov	Turkmenistan
Rafael José Rodríguez	Cuba
Miguel González González	Spain
Sietse Dijt	Netherlands
Franz Seckel	Germany
Paul Kerner	Estonia
Maaha Ayub	Pakistan
Ada Fang	Australia
Brecht Pierreux	Belgium
Jeykco Wilfredo Villavicencio Huanila	Peru
Davit Rizhinashvili	Georgia
Samuel Andrejčák	Slovakia
Matías González Pena	Argentina
Johannes Günzl	Germany
Santiago González Crepsac	Venezuela
Turan Mammadli	Azerbaijan
Hamlet Khachatryan	Armenia
Lucy Elena Bonilla Canales	El Salvador
Arthur Reiner De Belen	Philippines
Santeri Simanainen	Finland
Johan Lokna	Norway
Ofir Shmool	Israel
Charles Jerome Bartolo	Philippines
Lee Chee Hong	Malaysia
Alexandros Terzopoulos	Greece
Baïaman Bazarbaev	Kyrgyzstan
Michal Chovanec	Slovakia
Ieva Norvaisaite	Lithuania
Temirlan Rakhimov	Kazakhstan
Luca Udovicic	Croatia
Andrej Kovačević	Serbia
Saïddin Avtandil	Kyrgyzstan
Taido Purason	Estonia
Aleksandre Pichkhadze	Georgia
Siim Kaukver	Estonia

Honorable Mention

Kyriakos Ioannou	Cyprus
Susanna Kirakosyan	Armenia
Giuseppe Lasaracina	Italy
Silvestar Mravljinc	Croatia
Alejandro Valderrama-Celestino	Mexico
Eitán Sprejer	Argentina
Brayan Ramirez-Camacho	Mexico
Anže Hubman	Slovenia
Raluca Petrut	Canada
Aoss Abbas	Syria

Gold Medals	36
Silver Medals	65
Bronze Medals	95
Honorable Mention	10

See You Soon in Slovakia & Czech Republic

Chair of the 2018 IChO Steering Committee: I-Jy Chang

You Made Us All Proud!

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