

INTRODUCTORY ISSUE SUNDAY 20 JULY 2008



JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

UK welcomes the IChO



Prof Brian Johnson FRS, FRSC ident of the 41st IChO

I am delighted that the 41st International Chemistry Olympiad will be held in Cambridge, UK in 2009. This is the first time that the event has been convened in the UK and I am especially pleased that Cambridge is the chosen venue. Its reputation as a Scientific Centre is unsurpassed and I am very happy to have this opportunity to share the delights of my city with you.

Chemistry remains, as it must, at the very centre of scientific endeavour. It spans the Natural Sciences and provides a basis of so much of the progress in both the physical and life sciences. The International Chemistry Olympiad is second to none in its ability to communicate and explore chemistry with others and provides the ideal forum for a truly international occasion.

I look forward to seeing you all in 2009.

Brian Johnson





Dr Peter Wothers FRSC Chairman of the 41st IChO

My first visit to Hungary was as a competitor in the IChO. Little did I realise then that I would later come back to Hungary as Chairman of the 41st Olympiad to invite the IChO to the first competition to be held in the UK. I am particularly pleased that the event will be centred around the University of Cambridge during its 800th anniversary. Staying in some of the Colleges right in the heart of the city, students will have a chance to experience what life as an undergraduate is all about.

The mentors meanwhile will be spirited away to the great rival institution, the University of Oxford. They will be working long hours in the magnificent Examination Schools to prepare the examination papers. However, I am sure they too will find time to explore their beautiful surroundings, and perhaps even try their hand at punting on the river Cherwell.

As a previous competitor in the Olympiad, I look back on my experience with fond memories: it helped shape me into the chemist I am today. I would like to ensure that the 41st IChO has a similar impact on our young chemists of the future.

Peter Wothers



London

Capital of the World

Why, Sir, you find no man, at all intellectual, who is willing to leave London. No, Sir, when a man is tired of London, he is tired of life; for there is in London all that life can afford.

Samuel Johnson (1709-1784)

Although Dr Johnson's words date from the late 18th Century, his words are no less true today; although London can no longer claim to be the world's largest city, it's still huge with a population of 7,512,400 – rising to about 13 million if you include the whole metropolitan area. With a recorded history that stretches back over 2,000 years, it's impossible to see everything in a short visit but, as one of the financial and cultural centres of the world, there really is something for everyone.

The Royal Society of Chemistry

It is in London that the Royal Society of Chemistry, our joint host, is based. Since the mid-19th century the RSC headquarters have been at Burlington House, a stunningly beautiful building in Piccadilly which it shares with, amongst others, the Royal Academy of Arts.

The RSC is the largest organisation in Europe for advancing the chemical sciences, and is proud of having the longest continuous tradition of any chemical society in the world. Supported by a global network of over 44,000 members and an international publishing business, their activities include collaborating with schools and universities on matters of chemical education, conferences, science policy and the promotion of chemistry to the public.

Excursions

The mentors and students will have the chance to explore some of the attractions of London before meeting up for the Reunion Dinner which will take place in the Central Hall of the Natural History Museum. The museum holds world-class collections and mounts fantastic exhibitions in a landmark building in Kensington, just along the road from the famous department store, Harrods. With its cathedral-like structure, frescoes, sculptures and the fabulous *diplodocus* skeleton, the Hall will provide a truly unforgettable backdrop to our dinner.

RSC Advancing the Chemical Sciences



Tower Bridge



Trafalgar Square



Natural History Museum



The London Eye



The Palace of Westminister



Founded in 1209, the University of Cambridge is justifiably proud of its long history. Although it boasts a strong tradition in the humanities and arts, Cambridge is particularly famous for the long list of worldrenowned scientists and mathematicians it has produced – a fascinating group that includes Isaac Newton, Charles Darwin, Francis Crick and Stephen Hawking.

The University will celebrate its 800th anniversary in 2009, providing an opportunity to mark its amazing contribution to the world during this time: from the discovery of the mechanism of blood circulation to the structure of DNA; from the discovery of the electron to the first observation of a pulsar.

With 82 Nobel Prize winners having studied here, the University can claim more than any other institution. Of particular note is the chemist Fred Sanger, the only person to have been awarded the Nobel Prize in Chemistry twice – in 1958 and 1980.

Cambridge the City

Cambridge is a great place to enjoy yourself. Compact yet cosmopolitan, the city is easy to explore on foot and offers an amazing variety of museums and art galleries. In a single day you can take in the ancient Egyptian relics in the Fitzwilliam Museum, visit the North and South Poles at the Scott Polar Institute, see the original specimens Darwin collected on The Beagle, or admire paintings by Canaletto, Titian or Cezanne.

A truly green city, filled with parks, Cambridge is particularly beautiful in the summer. Famous for its annual Boat Race with Oxford (held on the neutral territory of the Thames in London!); you could sample the delights of the river for yourself by having a go at punting on the River Cam to Grantchester, or just relax with a picnic in the beautiful meadows alongside.

For England's the one land, I know, Where men with Splendid Hearts may go; And Cambridgeshire, of all England, The shire for Men who Understand; And of that district I prefer The lovely hamlet Grantchester.

Rupert Brooke (1887-1915)

Oxbridge

The Great British Universities



River Cam, Cambridge



Clare Bridge, Cambridge



Procession on the Streets



River Cherwell, Oxford



Christ Church, Oxford

Oxford University is a unique institution with a fascinating history. Teaching started in 1096, making it the first university in the UK, and a quick glance at some alumni reveals its far-reaching influence – 25 British Prime Ministers, 30 international leaders, 47 Nobel Prize winners, 6 kings and 12 saints! Included in Oxford's Nobel Laureates in Chemistry is Dorothy Hodgkin, the most recent of the three women who have won the prize in that subject.

The University's long history is illustrated in its many inspiring museums including the oldest in the UK, the Ashmolean Museum of Art and Archaeology. Established in 1683, this holds the University's extensive collections of art and antiquities, covering over four millennia. Of particular interest is the Museum of the History of Science: housed in the world's oldest surviving purpose-built museum, it contains an amazing collection of historic scientific instruments and chemical apparatus from around the world.

The Bodleian Library, founded by Sir Thomas Bodley in 1598, is the University's main research library and offers guided tours. The second largest library in the UK after the British Library, it owns over 8 million volumes housed on 120 miles of shelving. As one of the UK's six legal deposit libraries it is entitled to request a free copy of every book published in the UK, meaning its collection is growing at a rate of over three miles (five kilometres) of shelving every year.

Oxford the City

And that sweet city with her dreaming spires, She needs not June for beauty's heightening, Lovely all times she lies, lovely to-night!

Matthew Arnold (1822-1888)

The city itself is beautiful too; filled with stunning architecture, history and culture. You'll find ancient and modern colleges, fascinating museums and galleries, and plenty of parks, gardens and green spaces in which to wander. Like Cambridge, the city centre is small enough to cover on foot and is filled with tempting cafes in which to relax between the exertions of the Chemistry Olympiad.



Programme Outline

Date		Students	Mentors & Observers	
18 th July	Whole Day	Arrival & Registration		
Saturday	Evening	Welcome Dinner		
19 th July	Morning	Opening Ceremony - Cambrid	dge Corn Exchange Lunch - Cambridge Guildhalls	
Sunday	Afternoon	Safety Talk	Inspect Labs To Oxford 1 st Jury Meeting	
20 th July Monday	Whole Day	Excursion	In Oxford: Translation of Practical Paper	
21 st July	Morning	Practical Exam	In Oxford: 2 nd Jury Meeting	
Tuesday	Afternoon	Free Time	Excursion	
22nd July Wednesday	Whole Day	Excursion	In Oxford: Translation of Theoretical Paper	
23 rd July	Morning	Theoretical Exam	Deturn to Combridge	
Thursday	Afternoon Free Time		- Return to Cambridge	
24 th July	Whole Day	Excursion to London	Receive Answers	
Friday	Evening	Reunion Dinner		
25th July Saturday	Whole Day	Excursion	Arbitration 3 rd Jury Meeting	
26 th July	Afternoon	Closing Ceremony - King's College Antechapel		
Sunday	Evening	Banquet - Marquee on King's College Backs Lawn		
27 th July Monday	Whole Day	Departure		

Hosted in collaboration with

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	ERSITY OF			
RSC Advancing the Chemical Sciences				
Participating Colleges				
Viante				
Cambridge	Cambridge			
St Catharine's Cambridge	St John's Cambridge			
	Mandalan			
Cambridge	Oxford			
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UK Facts

Weather



Our climate is completely unpredictable - hence our obsession with weather forecasts, which invariably tell you the day will be cloudy with sunny intervals and some rain at times. Examining a piece of seaweed is probably as useful... It is therefore better to prepare for surprises; bring something warm and a waterproof even if you appear to have the promise of clear skies and hot sun. As a general rule though, the climate is mild and maritime with temperatures between 10° and $20^{\circ}\text{C},$ although the occasional heat-wave does sometimes occur if you are lucky.

We will have IChO 2009 umbrellas on stand-by!

Design & Layout Derek Chan & Montague Ring Photography

Derek Chan David Iliff Emma Rathbone

- Page 1: Trinity Fountain, Punts Page 3: all Cambridge photos Matthew Greenlee - Page 1: Radcliffe Camera Page 2: all other London Photos Page 3: all Oxford Photos - Page 2: Big Ben, Tower Bridge, Natural History Museum

- Page 1: Red Post and Telephone Boxes





JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day One: Arrival

Welcome to Cambridge, and the 41st International Chemistry Olympiad. Today people are arriving from over 70 nations, each eager to compete and explore a different country and culture.

Hosted jointly by the Universities of Oxford and Cambridge, this year's Olympiad will place you in attractive surroundings famous for their rich history, academic research and teaching quality. During your stay here, you'll get a unique insight into the student life and sample some of what Britain has to offer.



Oxbridge Rivalry Through the ages

Welcome to this Year's Chemistry Olympiad



AM DELIGHTED to welcome you to the 41st International Chemistry Olympiad, and the first to be held in the UK.

In the study and application of chemistry, the UK can claim a distinguished past, and we are investing in a promising future.

Chemistry is fundamental to the great challenges which face mankind: to food and energy production, the development of new medicines, to understanding the origins of our universe.

It is in the interests of all countries that new generations of talented chemists emerge to tackle these challenges – which makes the Olympiad such a valuable event.

It brings together the brightest young

chemists from across the world, not only to compete, but to forge lasting associations. It is from such encounters and friendships that major scientific breakthroughs so often result.

As UK science minister, I wish you the best of luck as you embark upon 10 days of intense activity. Look upon it as the trial run for what I hope will be – for each of you – a long and successful career in chemistry, and the first of many professional visits to this country.

Lord Drayson Minister for Science & Innovation

Head to Head

RIVALRY BETWEEN the universities started almost immediately after Cambridge was established nearly a century after Oxford after several Oxford scholars fleed hostile townsmen in Oxford and laid the foundations to Cambridge in 1209. As the two oldest universities in England, they are in constant competition with each other.

Perhaps the most famous ongoing battle is the Boat Race. It takes place annually on the river Thames in London. The first race took place in 1829 after a Cambridge student challenged his ex-school friend studying at Oxford to a rowing race. Oxford won that challenge and so the following year Cambridge requested a re-match. Members of the boats are known as 'blues' as both crews wear their corresponding university colours; Cambridge wear light blue, and Oxford dark blue. All other significant sports also have their own varsity match at some point during the year, each with a running total of their successes.

Indirect competition comes from the universities' alumni (university graduates). Oxford boasts all but two of the British Prime Ministers since the Second World War whereas Cambridge has more Nobel prize winners and has Isaac Newton and Charles Darwin as graduates. With such long histories, the success of each university is often difficult to compare,

"Perhaps the most famous ongoing battle is the Boat Race"



Oxford celebrate their win in the 2009 boat race

especially since many outstanding thinkers have been associated with both.

Undergraduate students are perhaps the most competitive, a trait born out of the fact that undergraduate admissions to the two universities are mutually exclusive. Hopeful students can only apply to *either* Oxford *or* Cambridge and not both. Hopeful students must decide on the university they prefer and, if accepted, often remain loyal.

Playful chants and namecalling is often passed between members of the two universities, but always in good jest.

Oxford and Cambridge are similar yet different in many ways. And while some scholars stay at one institution their whole lives, many have switched between them.

Excuse Me, Where's the University?

CAMBRIDGE IS A beautiful place to visit. It is a compact little city of over 130,000 inhabitants with some truly outstanding architecture. Walking through the streets is like walking through British history with a mishmash of unique buildings from different eras dating back hundreds of years. The picturesque surroundings and rich history make Cambridge a popular tourist destination. But the most famous landmark may be difficult to spot, so you'd be pardoned for asking, "Excuse me, where's the university?"

Unlike many educational institutes which have one central location, the universities of Oxford and Cambridge have buildings haphazardly scattered throughout their city. This is because these universities actually function with a relatively small central administration; they have an independent collegiate structure.

Collegiate universities are composed of a number of 'colleges', each acting as an independent institution with its own property, income, academic positions and sometimes research funding. The college provides accommodation and

"Colleges are like extended families, where everyone knows everyone"



"The picturesque surroundings and rich history make Cambridge a popular tourist destination"

catering for their students but unlike regular student housing, the colleges are responsible for far more. They have a large role in deciding student admissions, and are then responsible for their students' wellbeing with teaching shared between colleges and university departments.

Oxford and Cambridge are the only fully collegiate universities in the UK, and are amongst only a handful in the world. The intimate system of individual college tuition supplementing departmental lectures has been highlighted as the main contributor to the universities' academic success, attracting bright minds to come and study there.

To be a student of the university you have to be a member of a college. Since students are part of their college for their entire degree, many form a strong loyalty, often citing their college as the place where they study above the university name.

Colleges are like extended families; close-knit societies where everyone knows everyone. Student intake varies but there are typically between 50 and 150 students per year, all of whom intermingle and socialize together. Food is provided in the Buttery at set meal times, allowing the students to get together and discuss their day and share their thoughts. Parties are organized regularly and there are college clubs and societies, so tight bonds and eternal friendships often develop.

Cambridge currently has 31 colleges in total and Oxford has more with 38. The first Cambridge college was Peterhouse, founded in 1284, and the last was Robinson in 1977. A few colleges only accept female students, and some are dedicated to either graduate or mature students, but the majority have a broad range of students from different background and countries studying a wide range of subjects.

So if the response to where is the university is, "that way", it's bound to be correct. No matter where you turn in the centre of Cambridge you will come across some department or part of a college. In essence, the university is everywhere.



Oxbridge

Oxford and Cambridge University are similar in structure, age, prestige and surroundings, yet remarkably different to any other university in the country. Because of these similarities, the two are often referred to together, as 'Oxbridge'. This term composes **Ox**ford and Cam**bridge** in the order they were founded.

Daily Information

Student Programme		
All Day	Arrival and Registration	
19.00 - 20.30	Dinner, University Centre	



Cambridge Sunny intervals with a high of 19°C (66°F) and a low of 10°C (50°F).

Chance of rain: 19% Wind Speed: 37 kph

Mentor Programme		
All Day	Arrival and Registration	
19.00 - 20.30	Dinner, Robinson College	

Emergency Contacts

Police, Fire, Ambulance 112

Olympiad Help +44 7909 893283 +44 7900 405698

Accommodation Guide



Trinity College

Trinity is the largest college, having formed from the amalgamation of two earlier colleges. It is traditionally considered the most aristocratic of the Cambridge colleges, attended by many of the Royal Family.

Fact: Trinity is rumoured to be the richest college.

Student Number: 600 undergraduate and 300 graduate students.



St Catharine's College

St Catharines was founded at a similar time to its neighbour, King's College, although has been rebuilt and renamed since. It is often dubbed the 'friendly' college, as it is really close-knit and community driven.

Fact: St. Catz has a three-sided court (most courts are have four-sided). **Student Number:** 400 undergraduate and 150 graduate students.



St John's College

St John's was originally a 13th century hospital, before being converted into a college. Over the last 500 years the college has gradually expanded, and now has more courts than any other Oxford or Cambridge college.

Fact: St John's ball is rated as one of the top ten parties in the world. **Student Number:** 530 undergraduate and 300 graduate students.



Robinson College

Robinson is the newest Cambridge College, officially opened in 1981. As such it was one of the few colleges built after the invention of central heating, and has many other modern attributes missing from older colleges.

Fact: Robinson was built with one and a quarter million red bricks. **Student Number:** 400 undergraduate and 100 graduate students.



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JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Iwo: Opening Ceremony

Today's opening ceremony is the official start of the Olympiad. Much like the opening ceremony of the Olympic Games, this is a chance to introduce the participants and for the host nation to display its culture.

Taking place in the Cambridge Corn Exchange, the ceremony has a pantomime theme (see inside for details) so will require active participation from everyone. So sit back, relax and enjoy the show. But don't forget to join in! Medieval Guilds

and guildhalls

Medieval Guilds and The Cambridge Guildhall

AFTER THE opening ceremony in the Corn Exchange, we move across the road to the Guildhall for a well deserved lunch.

The Guildhall is situated next to the market square and plays host to conferences, wedding receptions and civic events. Despite the 'modern' appearance built in the 1930s, the history of guilds and guildhalls dates back to medieval times.

In the 13th century guilds became central to life in towns. They existed for every trade: weavers, tailors, cobblers, plasterers,

"Apprenticeships started at the age of twelve and could last up to fourteen years" blacksmiths and a host of others.

They were there to maintain standards. A trader had to be part of a town guild before he was allowed to sell anything there. Membership was an honour because it was recognition that your work had reached the required standard. Guilds also guaranteed a fair price for the goods that were made.

Members were looked after by their guild. Insurance was available for members involved in long-distance trade. Guilds also arranged the burials of its members, sometimes even providing financial support for the surviving family members. They also provided training in the form of apprenticeships. These could be quite a commitment; some started at the age of twelve and lasted for anything up to fourteen years.

The guildhalls were where members of each guild would meet to discuss matters that concerned them. Many were founded by the merchant guilds that profited vastly through trading goods. As



The main hall in the Cambridge Guildhall

well as guildhalls, they paid for some of the great civic buildings around the country. In 2005, Charles, Prince of Wales, and Camilla Parker Bowles were married in the grand but small Windsor Guildhall, close to Windsor Castle where the Queen spends most of her weekends.

The site of the Cambridge Guildhall has had a varied history as a jail then a synagogue before housing monks. When the monks vacated it was used as a town hall and collected tolls for entry into the town. After several refurbishments and restructuring, the current Guildhall was built in the 1930s. Despite never having been used for guild meetings, the name has stuck. The building was built in two parts, and a close look can reveal the line showing where the bricks don't quite meet.



The Guildhall Crest



Hungary and Romania



Finland in matching T-shirts



Arrivals at the bus station

He's Behind You!

"Pantomime: a theatrical entertainment, mainly for children, which involves music, topical jokes, and slapstick comedy, and is based on a fairy tale or nursery story, usually staged around Christmas; this style of performance as a genre." - OED Definition

CHRISTMAS WOULDN'T be Christmas without pantomimes. Each year families flock in their thousands to see the traditional play at their local theatre. The pantomime is a truly British institution. Fondly called 'Pantos' for short, every town and city will play host to their very own play, hopefully full of minor celebrities and slapstick humour.

Pantomimes are well defined by a familiar set of characters, outrageous costumes and audience participation. The stories are based on well-known fairy tales or folk legends: Cinderella, Aladdin, Dick Whittington and Snow White...the list goes on, but the essential components never change.

The plot is simple and can be best summarised as follows:

A girl (dressed as a boy) who is the son of a man (dressed as a woman) will win the heart of a girl (who this time is actually played by a girl) after escaping evil, and live happily ever after.

Confused? Here's are quick guide to the peculiarities of a typical pantomime.

The Principal Boy: Played by a girl! The Principal Girl: Played by a girl! The Dame: The mother of the boy and played by a man in drag (Watch out for the costumes). **Good and Evil:** Tradition dictates that Good enters the stage from the right and Evil enters from the left.

The Fairy Queen: Normally given different names, the fairy queen will help the young adventures during their quest.The Demon King: Tries to make the lives of the innocent characters as miserable as possible.The Demon King always appears first followed by the Fairy Queen.

Audience Participation: This is central to the fun of a pantomime – it's an interactive experience. Audience participation is essential and the most important traditional aspect of the play. The audience must boo at the villain whenever he enters: *"Boo!!!"*. Warn the boy when the villain is behind him: *"He's behind you!!!"*. And argue with the bad characters something like this:

Ugly sister: "I'm much prettier than Cinderella." Audience: "Oh no you're not!" Ugly sister: "Oh yes I am." Audience: "Oh no you're not!"

Hopefully, this should prepare you for what's to come. Part of the fun of a pantomime is getting involved. So don't just sit there, take part.





Iceland get into a taxi



Latvia at the bus station

Yesterday

Here are some of your first impressions:

"We are very happy. Everyone is very nice and we are looking forward to the week." Vlad Puscasu, Romania

"I am going to enjoy my time here. It is my first time in Cambridge and at the IChO and I cannot wait to get started." Laura Averia, Latvia

Daily Information

Student Programme		
08.00-08.45	Breakfast, your college	
09.15-12.00	Opening Ceremony, Corn Exchange	
12.00 - 13.30	Welcome Reception, Guildhall	
14.00 - 18.30	Guided Tour of Cambridge and Free Time	
19.00 - 20.30	Dinner, University Centre	

Noticeboard

Police, Fire, Ampulance 112	Police,	Fire,	Ambu	lance	112
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Olympi	ad Help	+44 7909 893283		
	+44 7900 405689			
Email	il admin@icho2009.co.uk			
Web	www.icho2009.co.uk			

Join the Facebook Group

Keep up with what's going on and stay in contact with friends after the event.

41st International Chemistry Olympiad, Cambridge 2009.

tinyurl.com/icho2009

Mentor Programme		
7.30 - 8.45	Breakfast, Robinson College	
9.15 - 12.00	Opening Ceremony, Corn Exchange	
12.00 - 13.30	Welcome Reception, Guildhall	
13.30 - 15.00	Lab Inspections, Departments of Chemistry and Zoology	
From 14.30	Bus Departures, from Department of Chemistry	
17.00 - 18.30	Meet with Authors, St Anne's College	
19.00 - 20.30	Dinner, Examination Schools	
20.30-22.00	1st Jury Meeting, Examination Schools	



Oxford and Cambridge

Mostly cloudy with some showers, reaching a high of 20°C (68°F) and a low of 11°C (51°F).

Chance of rain: 82% Wind Speed: 10 kph

Problem Page

1. Ice Follies

Suppose the Olympiad was held between only five countries. A country's score equals their placement (1 to 5) in the practical exam multiplied by 0.5, plus their placement in the theory exam. For example, if a country finishes fourth in the practical exam and third in the theory exam, their score would be 4(0.5) + 3 = 5. In the case of a draw, the country which did better in the theory exam wins.

Let's suppose that the order for the practical exam was A, B, C, D and E. It turns out that after the theory exam there was a three-way tie for first place. Who won?

2. The Max Factor

If a venue was filled to capacity and held 319 people. Assuming that each row contained the same number of people, how many rows were there?

3. Binary Operation

What is the smallest number consisting of only 0's and 1's that is divisible by 15?

4. Base Ten

Suppose the numerical pyramid below kept on going. What would be the sum of the numbers in the 10th row?



Find out the answers in tomorrow's Catalzyer

Sluesci Cambridge University Science Magazine Written and Produced Images

Chris Adriaanse and Amy Chesterton Anna Betts (cover), Beth Ashbridge, Christopher Kerr and Chris Adriaanse









International





JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Three: Belvoir Castle

In the middle of a vast 120 km² estate in the county of Leicestershire sits Belvoir Castle. The elegant castle is home to the Duke and Duchess of Rutland and is open to the public offering a host of outdoor activities; including dog, sheep and duck exhibitions.

Today you'll be trying some of the exciting activities on offer and get the chance to enjoy the British countryside.

Owning a Castle And Becoming a Lord

Review: Opening Ceremony

THERE WERE probably as many laughs as groans, but that's how it should be. A pantomime themed ceremony that introduced each country with play on words was always going to be challenging, particularly when faced with an international audience, but the result was an action packed hour and a half.

The event started with three short speeches. The first was from the Vice-Chancellor of Cambridge, Professor Alison Richard, proudly welcoming



the participants to the UK and to Cambridge. The second was from the President of the Royal Society of Chemistry who chose to emphasise the breadth of chemistry and the remaining unsolved issues in the subject. Finally, Professor Duckhwan Lee, chairman of the IChO steering committee, stressed the opportunity the Olympiad provides to make friends and not to just compete. Then it was onto the main event.

Next to appear on stage was 'Nige', the stage manager. After his introductory song of the participating countries in quick succession, it was left up to him to explain the pantomime theme and what would be expected of the audience. The encouragement to shout and argue alongside cast members was quickly adopted, sometimes a little too enthusiastically (Portugal!). As the pantomime started, the audience participation

Country Jokes...

ADA: No, *Bra's ill* (BRAZIL). If she *has her by Jan* it'll be soon enough. (AZERBAIJAN)

JACK: *I ran* all the way. (IRAN)

ADA: (to off stage) Look out! You nearly got me *in the knees 'ere*. (INDONESIA)

ADA: If I fall *I'll land* on you. (IRELAND)

ADA: If he'd sold Stan I could have gone by plane! Or *is rail* a safer way to travel?' (ISRAEL)

ADA: *You know Ted, state* of this isn't good. (UNITED STATES)

GIANT: But, you're a guy! (URUGUAY)

GIANT: Is that *mould over* the top? (MOLDOVA)

JACK: Stan'll never land on that! (NETHERLANDS)



"The pantomime comprised of all the traditional ingredients"

got some practise (with a little help from those on stage). As the countries were introduced our language skills were tested to breaking point - some were obvious, some were hilarious, a few were missed but it was a novel way to introduce each country. The dame Ada was the highlight of the performance as she commanded the stage and the audience and

effortlessly handled the

hecklers with a quick wit and bags of energy. The pantomime comprised of all the traditional ingredients: slapstick humour, crossdressing, audience participation, songs, dances, two men dressed as a cow, and a chemistry theme.

The traditional bean-stalk was replaced by a DNA strand, which the characters had to climb to find their fortune. What awaited was a laboratory full of scientists and a self-proclaimed 'chemistry student'. Certain that Jack was a 'celebrity', his chemistry knowledge was tested until finally allowed to be released. Instead of a bellowing giant at the top of the stalk we had a lab supervisor with short-man syndrome, whom Ada grew quite fond of.

After a few chases around the stage, some comical milking of a cow and several chemistry jokes, the show came to a close. As Jack married his true love, Jill, all in pantomime-land rejoiced. This happy ending was mirrored with smiling faces from the audience, happy with their first taste of British culture.

Becoming a Lord and Owning a Cas-

IN A QUIET corner of Belvoir Castle, away from all the crowds, live the Duke and Duchess of Rutland. The castle has been their family home for the past 500 years, passed from generation to generation. With it comes the Duchy of Rutland and the grand title of 'Duke'. So how do you get to live in one of Britain's grand stately homes? And how do you become a Duke, or even a Lord, an Earl or a Baron?



For a couple of million pounds (\$3.5 million USD or €2.3 million) you can easily buy a castle or a grand stately home. Many are passed down through the family though, meaning the easiest way to obtain a castle is to inherit one. While this seems like the cheapest option, inheriting such a house can be both a blessing and a curse.

As with many old houses,

"If you are lucky, you can inherit a lordship or marry into one"

scale of many stately homes can mean repairs run into millions of pounds. The buildings are also 'listed', meaning that they must be preserved in their current state, replacing like-for-like which is expensive when restoring antique features. The high cost to maintain a stately home means that

repairs and renovations

can become costly but the

a stately home means that many owners subsidise their income by using their homes for more than just their residence. Many estates are open to the public or have attractions in the grounds, even renting out their homes to film crews or tourists.

So the fairy tale dream of living in a castle may not always live up to expectation. Many listed buildings have been handed over to charities when the owners can no longer afford to run them.

Becoming a Lord or a Duke is another matter. Again, if you are lucky, you can inherit a title or marry into one. Throughout history a series of titles were created to maintain order in the land and provide council to the sovereign. Dukes, Marquees, Earls, Viscounts and Barons, listed in decreasing seniority, were awarded to govern over different parts, regions and towns of the country.

The titles have arcane rules in how to address those blessed with them, related to their seniority and refer to the land they oversee. Marquees, Earls, Viscounts and Barons can all be referred

to as Lord. The exception is a Duke, the most senior noblemen, who must be called "Your Grace" when addressed. Sons and daughters of Dukes and Marquees are called Lord or Lady and have a separate title until they inherit the more senior one.

For people who lack such a heritage and have failed to mix in to the right social circles, there is another way to a title: a life peerage. As the name suggests, these titles only remain for the bearer's lifetime. Life peers are created for individuals on retirement from important public offices such as Prime Minister. There is also a commission that recommends peerages for people who will make a significant contribution to the work of the House of Lords.

The exciting thing about life peerage is that you get to decide where you want to be Lord of, as long as noone else holds that title. Although many well known places are already taken, most

"For a couple of million pounds you can easily buy a castle or a grand stately home"

life peers can still choose their home-town.

So if you weren't fortunate enough to be born with a title and castle you can still get one. It seems the best way is to marry wisely. However if that fails, winning the lottery and running for parliament will certainly help your chances.

Belvoir Castle

Belvoir Castle has belonged to the Duke of Rutland's ancestors since 1509, making it their 500th anniversary this year. Due to its special historical significance, the castle has been listed as a Grade 1 building. This status forbids it from being demolished, extended or altered without special permission, and compels the owners to repair and maintain it.







"The first song from Nige the stage manager was the best bit"

PAKISTAN



IRELAND



"We were last so we were waiting for our name for ages"

NEW ZEALAND











"Could have been more embarrassing"

UNITED KINGDOM







The Nobel Prizes



EVERYONE WANTS to win a Nobel Prize. You'd be hard pressed to find someone who doesn't. Each year the Royal Swedish Academy of Sciences go through a lengthy and secretive nomination process before awarding the prizes. But what is it about the Nobel Prize that captures the imagination of almost everyone on the planet? And why did Alfred Nobel decide to create the Nobel foundation?

Alfred Nobel started life as a chemist working for his father, a weapons manufacturer. The pair were looking at the properties of the chemical explosive nitroglycerine (1,2,3-trinitroxypropane) when Alfred made the discovery that would change his life.

The explosive had been discovered a couple of decades earlier but its unstable nature made it perilous to mass produce and transport. Alfred provided the answer. By

mixing nitroglycerine with a silica based oily fluid called kieselguhr, he stabilised the compound and in the process invented dynamite.

created his prizes to atone for what he had created. When his brother died. a French newspaper mistook him for Alfred and published the wrong obituary. The newspaper described Alfred as a man who had made it possible to kill more people, more quickly than anyone else before him. Realising how he was going

bonds, was the winner. There's often a considerable time lag between the deserving discovery and the awarded prize. The average period is an It is speculated that Nobel incredible 20 years! Nobel had

stated in his will that the prize should be awarded to "those who, during the preceding year, shall have conferred the greatest benefit on mankind." But after a couple of embarrassing incidents where the prizes had to be returned after the theories or discoveries were retracted, the Nobel council moved to focus on

"Alfred Nobel started life as a chemist"

to be remembered he rewrote his will, leaving his fortune to create prizes for the "greatest benefit on mankind".

Recent years have seen the chemistry prize awarded for a host of breakthroughs. Last year the discovery and development of the green fluorescent protein was recognised. The protein has found a wealth of applications as a label in biology and been mutated to create a wide range of colours. The year before the holy grail of organic synthesis: forming new carbon-carbon

discoveries that stood the test of time.

Cambridge chemists have done particularly well at discoveries worthy of a Nobel Prize. Nineteen affiliates (past and present fellows and graduates) have been awarded one since they started – nine more than Oxford. Cambridge also claims the only person to win two Nobel Prizes in chemistry. Frederick Sanger was awarded the prize in 1958 for determining the structure of insulin and again in 1980, just before he retired, for virus



nucleotide sequencing.

The answer as to why the

Nobel Prize captures the imagination of the public and academics so vividly is difficult to pin down. Simon Frantz, who works for Nobelprize. org, thinks a combination of factors might be involved. "It was the first prize to reward research internationally, and to publicly highlight the value of basic research and its quest to answer fundamental questions that benefit mankind." This, combined with the "independent selection process carried out behind closed doors", and the continued outreach work of many of the Laureates to inspire the next generation of scientists, seems to have elevated the prizes to their current status.

A Nobel Prize remains the pinnacle of recognition for scientists across the world. We all dream of winning it one day, and who knows, maybe someone here at the 2009 Chemistry Olympiad will make that dream come true.



Pronunciation Quirks

"BELVOIR" AND "Leicestershire" are not easy words to pronounce, even for native English speakers. Belvoir is mysteriously pronounced like 'beaver' and Leicestershire as 'lester-shire'.

English pronounciation can be particularly challenging and the spelling often provides few clues. Much of this can be explained by its complex history: approximately a quarter of our words come from Latin, a quarter from French, a quarter from the Germanic languages and the rest from many other influences.

English Examinations

EVERYONE PARTICIPATING in the Olympiad will soon be sitting, or will have recently sat, their final school exams. In Britain compulsory schooling ends at sixteen, when pupils complete approximately ten exams (called GCSEs) in core subjects. Those who want to continue and go to university must sit their AS and A2 level - collectively known as A-levels - exams.

A-levels give students a chance to specialise, typically studying just three or four subjects over the course of two years, until the age of 18. This specialisation is early compared to most other countries, and has its advantages and disadvantages. You can easily drop the subjects you hated

"Degrees in the UK can be dramatically shorter"

or were no good at but the price you pay is having a narrower education.

Another consequence of this system is that our time at university can be dramatically shorter than other countries' degree courses. A typical bachelor's degree is just three years, a master's an additional one year and a PhD between three and four years. Compare this to the USA where you'd be studying for four, two and five years respectively.

There's also much debate in the UK as to whether A-levels are getting easier. Each year record numbers of students receive the top 'A' grade and the media are quick to declare that standards are falling. Universities too are finding it harder to distinguish between students. The solution for many exam boards has been the introduction of a higher grade, an A*, in the attempt to help this.

Another solution to this by Cambridge International Examinations was to develop a completely new alternative to A-levels. Called the Cambridge Pre-University Qualifications

Sir Harry Kroto

A patron of this year's Olympiad, Kroto was awarded the 1996 chemistry Nobel Prize for the discovery of C₆₀ whilst a researcher at the University of Sussex. The fullerenes, as they are known, are the only pure form of carbon and their discovery led to an entirely new branch of chemistry.

The result is a language with lots of quirks. But don't worry, we struggle too. Have a read of the sentences below and see if you can work out how to pronounce them correctly:

- The bandage was wound around the wound.
- There was a row among the oarsmen about how to row.
- They were too close to the door to close it.
- The wind was too strong to wind the sail.
- After a number of injections my jaw got number.
- Upon seeing the tear in the painting I shed a tear.

(Pre-U), the exam unequivocally distinguishes the best students and also helps to better prepare students for the transition to university. The new exams hope to go international in the near future, so many of you may see your younger siblings taking the course.

The redesign of their courses allowed them to emphasise different skills and encourages individual thought, rather than parrotfashion learning. Their chemistry exam, for example,

places problem-solving as the central objective and requires students to do some independent research. The courses' unique stress on understanding rather than learning means that students won't need to remember any of the equations, as they'll all be provided.

Testing of the Pre-U syllabus began in schools last September and the results have been encouraging. The plan is to offer the course to more schools, so it could be heading to your's soon.





Daily Information

Student Programme		
08.00 - 09.00	Breakfast, Your College	
09.00	Bus Departs to Belvoir Castle	
10.30 - 17.00	Medieval Activities	
17.30	Bus Departs back to Cambridge	
19.00 - 20.30	Dinner, University Centre	



Cambridge Mostly cloudy with a high of 18°C (64°F) and a low of 13°C (55°F). Chance of rain: 74% Wind Speed: 19 kph

Noticeboard

Police, Fire, Ambulance Olympiad Help +44 7909 893283 +44 7900 405698 Email admin@icho2009.co.uk

Belvoir Castle

Oxford

Mentor Programme

Breakfast, College

Practical Exam

Translation, Examination Schools

Lunch, Examination

Schools

Practical Exam

Translation, Examination Schools

Reception, University

Museum of Natural History

Mostly cloudy, some showers with a high of 20°C (68°F)

and a low of 11°C (51°F).

Chance of rain: 86%

07.30-09.00

07.30 - 12.30

12 30 - 14 00

14.00 - 20.00

19.00 - 20.30

Don't forget to take warm clothing on today's outing. There is also a high chance of rain.

Whoops! Chemistry by Accident

German scientist Christian F. Schönbein could often be found experimenting at home, despite being forbidden by his wife.

One day when she was out, Schönbein was up to no good, when he spilt nitric and sulfuric acid all over the kitchen table. Worried he'd get in to trouble on his wife's return, he grabbed the nearest item, a cotton apron, to wipe up the mess.

He almost got away with his antics, but whilst drying the apron over the stove it spontaneously ignited and exploded!

Schönbein had discovered nitrocellulose, also known as guncotton, a mild explosive still used today in rockets, propellants, printing ink bases and leather finishing.

The process uses the nitric acid to convert the cellulose in cotton into cellulose nitrate and the sulfuric acid is present as a catalyst to produce nitronium ion, NO²⁺.

 $3HNO_3 + C_6H_{10}O_5 -> C_6H_7(NO_2)_3O_5 + 3H_2O$

Jolly Belin's fortune was secured after he forgot to change his dirty clothes. The Frenchman was going about his daily business when he spilt kerosene on himself.

After noticing that the fluid had removed all stains in the area, he decided to carry on experimenting. After refining the process he opened up a shop in the 1840s and dry cleaning began.

Kerosene is a mixture of liquid hydrocarbons (C_xH_{2x+2}) between 12 and 15, making it flammable and therefore dangerous to use in the dry cleaning business.

Today, dry cleaning is any cleaning involving organic solvents instead of water.

The most commonly used fluid is tetrachloroethylene because it dissolves many organic substances and, critically, is stable and non-flammable.



Tetrachloroethylene



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Department for Innovation, Universities & Skills



UNIVERSITY of CAMBRIDGE

Written and Produced Images Sub-Editor Email

Yesterday's Answers: 1) Country E, 2) 11 rows, 3) 1110, 4) 1000 (10³)

Chris Adriaanse and Amy Chesterton Bob Kent (cover), Anna Betts (centre-fold) and Peter Wothers Joe diCapite catalyzer@bluesci.org



ßluesci





JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Four: Practical Exam

Chemistry is both an experimental and theoretical science and as such, our competence in both must be tested. Today it's the practical exam. As Albert Einstein once said;

"No amount of experimentation can ever prove me right; a single experiment can prove me wrong."

Today is a chance to show off your skills, learn something new and have some fun. So make sure you calm your nerves, have a steady hand and off you go!

> Vitamin B12 Cambridge's contribution

Food for Thought The role of chemistry

Food For Thought

IN ESSENCE, you are what you eat. Bone, hair, skin, cells, anything you can think of is comprised of and repaired from what you digest. A constant food supply is essential for human existence. Although it sounds more like biology, food research is a topic sweeping across all of the sciences, and increasingly calling on chemists to provide answers.

"Food science is becoming a fast growing discipline"

Scientists have tinkered with food structure, texture, taste and feel. Flexible chocolate, crust less bread and blue strawberries are just some examples of how researchers have been spending their time. The research has mainly been funded by industry. Their biggest concern? How to sell more products than their competitors. But times are changing; population growth, climate change, and land competition combined with energy burdens are causing problems with basic supply and demand. Coupled with increasing awareness of sustainability, the food chain is developing problems, and the topic of food science is becoming a fast growing discipline.

The Royal Society of Chemistry (RSC) has identified key food-related challenges requiring immediate action: agricultural productivity, food safety, process efficiency, healthy food and supply-chain waste are just a few. They are calling on distinguished scientists to address these concerns.

Opportunities for the chemical sciences are endless. Pesticides are essential to prevent crop losses; however they come with potential toxicity risks to humans and other animals. Shockingly, it has been postulated that over 98% of sprayed insecticides and 95% of herbicides eventually reach a destination other than that



Pesticides increase crop yield but are toxic in high concentrations



Farmers struggle to grow enough food for the ever increasing population, especially during climate change.

intended. The fallout affects non-targeted wildlife, other crops, the local air and water quality. Targeting pesticides to specific crops, without altering wildlife conditions is an active area of research.

Another active area is preventing food spoilage. Food naturally deteriorates by the effect of enzymes, but it's the growth of microorganisms, which if left untreated, decay the food and cause food poisoning. There are ways to slow or prevent this: cooling to prevent microbe growth and heattreatment to kill them, but they are not always feasible until after the food has been transported. New additives and storage devices are currently being developed to meet these challenges.

Functional and intelligent packaging films are also under investigation. Bioplastics are already common, made from renewable biomass sources, such as vegetable oil, starch or sugar. As biodegradable materials, their use is particularly suited to food packaging. But bioplastic development is far from complete. Shelf life is limited because many of the plastics are permeable to water, and as biomaterials they are often attractive breeding grounds for micro-organisms. Their

"Opportunities for the chemical sciences are endless"

use could also contribute to an accelerated rate of deforestation if not managed effectively and so research prevails in this area.

This year is 'Food '09' for the Royal Society of Chemistry highlighting the vital importance of chemistry in the food industry. Boosting production and ensuring the food reaches its destination in an edible state are projects already underway. With increased publicity and scientific backing it is hoped that chemists will meet some of the challenges.

Vitamin B12

YOU'LL HAVE seen the huge molecular model on the front lawn of St Catharine's College. The structure is vitamin B12, the largest and most complex of all the vitamins, and the final one to be isolated. The vitamin's structure, along with its synthesis in nature and in the lab, was worked on over several decades by distinguished chemists working at the cutting edge of technology.

Up until the early 20th century, pernicious anaemia – a blood disorder – was deadly. Doctors Minot and Murphy (who went on to win a Nobel Prize for their work) discovered that they could cure their patients symptoms by prescribing a daily portion of raw liver. We now know that the magic ingredient was vitamin B12, and the illness was caused by its deficiency.

With the treatment known, work began to isolate the active substance. After complications and setbacks caused by a limited number of suitable patients to screen potential agents, a bacterium was found that also needed the vitamin, which accelerated the purification and testing processes. The molecule was isolated almost simultaneously in 1948 at the Glaxo laboratory in England,

and the Merck lab in



compound formed beautiful deep-red crystals, but what caused this brilliant colour? In the days before advanced structural determination

"The purified compound formed beautiful deep-red crystals"

HoN



Molecular model of vitamin B12 on St Catharine's lawn

techniques, all that was known was the approximate empirical formula $C_{61-64}H_{84-90}N_{14}O_{13-14}PCo.$ Clearly, much work remained.

Alexander Todd, an eminent chemist who later came to Cambridge, started using a degradative approach to solve the problem. He broke the molecule up into smaller parts that were easier to characterise but it proved particularly challenging. It was Dorothy Hodgkin in Oxford (using Todd's

samples) who was finally able to solve the mystery using pioneering x-ray crystallography, and won a Nobel prize for her work.

With the structure solved and the colour attributed to the coordination of the cobalt atom, the challenge was on to see if it could be made in the lab. It was finally synthesised by collaborators Albert Eshenmoser at the ETH in Zurich and Robert Burns Woodward at Harvard University, and took a team of 100 scientists 12 years to complete. The achievement still remains a landmark case of natural product synthesis.

During the same period, a team of scientists at Cambridge led by Alan Battersby were trying to find out how nature solved the same problem, a feat Battersby has often described as the "Everest of biosynthetic problems" and whose work was awarded the prestigious Copley Medal.

"What you have to remember," says Battersby about the challenge, "is that proteins, for example, are more complicated but they're built up of umpteen small building blocks. B12 is complex in its own right."

Collaborating with French biochemists, the team were able to solve the problem with NMR, isolations, purifications, radioactive carbon-14 labelling combined with the genetics, molecular biology and enzymology. But what made the biggest difference was the development of carbon-NMR, making it possible to label multiple sites in the molecule. The result was a pathway that no one would have imagined. "It was much more subtle and clever than we would have thought".

"Vitamin B12 was the Everest of biosynthetic problems"

Battersby remains fond of the molecule and is still amazed by its function: "It really is a beautiful molecule. What it does in a living system is quite incredible. We need so little to keep us healthy."

The structure is a fitting tribute to the challenges chemistry can provide and the work of Cambridge chemists as well as the many hundreds of people around the world who have worked on the problem. And it's appropriate too that the model should be displayed at St Catharine's College where Sir Alan Battersby has been a fellow for the past 40 years. "Archery was fun. I've never done it before so it was really interesting"

AUSTRIA





Yester picture thoug Belvoir





"The castle suprised me because it wasn't what I expected more of a palace than a fort"









"It was good meeting people from different countries"



SPAIN

day in es and hts on Castle











"We did archery, jousting and tug of war but it was tiring"







"Lots of fun! The moment I enjoyed most was the tug of war. You could really feel the team working together"





I Spy!

Keep your eyes open and tick each typically British item as you spot it...

Academic Dress

Traditionally a mortarboard and gown worn by those admitted for a degree. The clothing was once worn every day, but since medieval times it is only commonly seen during graduation ceremonies. There are, however, other special occasions, and you may see someone wearing the clothing whilst in Cambridge. *More Cambridge than British.



Cricket

The game is thought to have originated in 16th Century England. Still popular today, it is now played by most Commonwealth nations.

Major cricket matches can take as long as 5 days to complete, although there is a 1-day match alternative. In England many county matches of both forms take place over the summer months. You may see students or locals practicing on Parker's Piece.



Bowler Hat



A stiff felt hat with a rounded crown. The bowler hat was originally created as a middle ground between the formal top-hat worn by the upper class, and the casual flat-cap worn by the working class in

Victorian Britain. Trinity College, Cambridge, is one of the last remaining places where bowler hats can be seen on a daily basis. Their porters still proudly wear their bowler hats at work.

Black Cab



Originally horse-drawn, black taxis were the first regulated public transport system in the world. King Charles II stated in the 17th century that all taxis were to be licensed. Many of the early traditions still stand today. Fares for the London district are still set by Parliament, and a stationary

taxi can only refuse journeys over 6 miles, a regulation leftover from the days when the horse may become fatigued or thirsty. Taxi drivers are also a law unto themselves as they are not required to wear a seat belt when working and are not legally obliged to give change. Black cabs are associated with London but many can be spotted in other British towns and cities.

Cadbury Chocolate

Chocolate is a worldwide luxury, yet recipes differ from place to place. Cadbury was one of the first companies to make chocolate bars in England. Founded by two brothers in Birmingham, Cadbury is still a leading confectionary company. English chocolate has a richer, creamier taste than some countries as the cooler climate allows more milk products and less wax to be added.

Double-Decker Bus

Buses with two levels are popular in several European cities and parts of Asia, particularly former British colonies, where normal uses are for long distance journeys or sight-seeing tours. Rarely, however, are they used as every day city buses like in England. Red double-deckers are a symbolic image of Britain and date back to the time when they were horsedrawn.



Police



Unlike police officers in many other countries, British policemen do not carry firearms on standard patrol. Armed with an extendable metal baton and pepper spray, they have to rely on specially trained units if criminals with weapons are involved. Their uniforms were originally designed to blend in with the public, but are now designed to stand out, often with high-reflectance jackets. The picture shows the policemen wearing the traditional Custodian helmet.

Rain

As an island, the surrounding sea dictates the UK's weather. The bordering water warms and cools slowly, making our



winters mild, but summers cool. Average temperatures for July are 15-20°C (60-70°F) so warm clothing is required even in the summer months.

Wind generally hits England from the west after crossing the Atlantic Ocean, where it picks up moisture. Over higher ground, found in the north and west, the air rises, cools, and rain falls. Many people perceive it to rain a lot in London, but as a relatively low-lying city, its rainfall is similar to other European capitals. Having said that, rainfall is fairly even throughout the year, so you will most likely experience rain whenever you visit.

Fish and Chips



The popular dish of deep fried fish and chipped potatoes originated in the UK. The meal was historically associated with the working class, deemed a cheap meal not fit for the rich. During World War II however, it was one of the few foods not subject to rationing, and became a popular take-away food for all classes. Mushy peas or curry sauce are often offered as accompaniments.



Post Box

Post boxes were historically painted green and were introduced to Britain after inspiration from several other European countries. Visibility issues led to their colour change to red, which was followed by the introduction of a standardised design. The 'pillar' design (as shown) is one of three in use today, altered only slightly over the last 150 years, and regarded as the most iconic.

Tick List

- □ Academic Dress
- Bowler Hat
- Black Cab
- □ Cadbury
- Chocolate

- Double-Decker Bus
- □ Fish and Chips
- □ Police
- □ Post Box
- 🗆 Rain

Daily Information

Student Programme		
06.45-08.00	Breakfast, University Centre	
08.30	Safety talk, Chemistry or Zoology	
09.00 - 14.00	Practical Exam	
14.30 - 16.00	Lunch, University Centre	
16.00	Group Photo, St Catharine's College	
16.00 - 19.00	Free Time	
19.00 - 20.30	Dinner, University Centre	

Mentor Programme 07.30-09.00 Breakfast, College 08.30 - 12.00 Guided tour of Oxford 12.30 - 14.00 Lunch, St Anne's Meet authors, St 14.00 - 18.30 Anne's Dinner, Examination 19.00 - 20.30 Schools 2nd Jury Meeting, 20.30 - 22.30 **Examination Schools**

Noticeboard

Timetable Change:

ICHO GROUP PHOTO Today, 16.00, St Catharine's College, Cambridge Bring your name boards

Hope the exam went well!

112

Cambridge

Oxford

Rain with a high of

18°C (64°F) and a low of 12°C (53°F).

Chance of rain: 57%

Wind Speed: 14 kph

Heavy rain with a high of 19°C (66°F) and a

low of 11°C (51°F).

Chance of rain: 78%

Wind Speed: 16 kph

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Einstein's Riddle

During the 19th century, Einstein is said to have this riddle, claiming that 98% of the world population would be unable to solve it. Are you in the top 2% of intelligence? Try the riddle to find out...

In a street there are five houses, each painted a different colour. In each house lives a person of different nationality. These five homeowners each drink a different kind of beverage, smoke a different brand of cigar and keep a different pet.

- 1. The Brit lives in a red house
- 2. The Swede keeps dogs as pets
- 3. The Dane drinks tea
- 4. The Green house is next to, and on the left of, the White house
- 5. The owner of the Green house drinks coffee
- 6. The person who smokes Pall Mall rears birds
- 7. The owner of the Yellow house smokes Dunhill

- 8. The man living in the centre house drinks milk
- 9. The Norwegian lives in the first house
- 10. The man who smokes Blends lives next to the one who keeps cats
- 11. The man who keeps horses lives next to the man who smokes Dunhill
- 12. The man who smokes Blue Master drinks beer
- 13. The German smokes Prince
- 14. The Norwegian lives next to the blue house
- 15. The man who smokes Blends has a neighbour who drinks water
- There are no tricks, just pure logic, so good luck.

Find out the answer tomorrow



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erve

JOURNAL OF THE 41ST INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Five: Cambridge Trail

After yesterday's practical exam, a day off is well deserved. But rather than reflect on yesterday's performance or fret about tomorrow's exam, we've got an action packed adventure lined up.

Today we'll be exploring the city, completing various challenges and partaking in a variety of activities. Teams of five will be organised shortly, so get to know your new group and take on the competition!

> Practical Exam Your thoughts

A CONSE du

Elizabeth II Queen of the UK

Review: Practical Exam



"The practical exam was always going to be a challenge"











In Numbers

5 labs 11 demonstrators 12 technicians 253 participants 2024 plastic pipettes 4807 pieces of glassware 18000 seconds long

WITH THE GROUPS split between the departments of zoology and chemistry, the participants arrived at their respective lecture theatres early in the morning to hear the safety talks. As everyone gathered, nerves and excitement escalated. Some grew restless, waiting to start, whilst others felt prepared and confident. The practical exam was always going to be a challenge and the time had come to find out exactly how hard this year's exam would be.

Dressed in white lab coats, the students were shown how to use some of the equipment. The demonstrations were straightforward and most of the equipment was familiar but it gave the opportunity for a first glimpse of what was to come.

The news that participants

could just leave their equipment at the end and needn't wash up was greeted by a round of applause in chemistry, easing the tension in the room. After questions, students packed away their stuff and nervously waited as they were led in groups to their lab to begin the 15 minutes reading time before the practical exam started.

Inside, the laboratory was a magnificent display of colours. Green, orange, blue and yellow helium balloons marked the locations of the shared equipment, lab assistants wore red lab

"There were so many things to do"

"The exam was divided into three tasks"

coats and the benches were adorned with colourful trays containing the equipment.

The exam was divided into three tasks. Task one was an environmentally friendly aldol condensation. The reaction proceeds without needing an organic solvent so there was no need for a fume cupboard. Task two required the analysis of a copper (II) complex using titration that required the determination of the proportion of copper and chloride ions and the composition. The final task was to calculate the critical micelle concentration of a

surfactant, an unusual one because participants had to plan their own experiment and were only given clues on how to proceed.

Thoughts afterwards were fairly unanimous, "The exam wasn't difficult but there wasn't enough time" said Turkmenistan, adding "I did manage to do all of it, but not sure if I did it all correctly". Singapore agreed, "We were very busy as there were so many things to do". Apart from the time limit, which seemed to hinder a lot of people, the tasks were perceived as fairly straight forward, "It was fun working through the problems. I enjoyed it" said Ukraine. Whilst some chose to dwell on the exam they had just sat, Korea looked onwards to the next exam, "I'm looking forward to the theory exam, that should be much better."

Queen Elizabeth II

TODAY'S ROYAL family have far less power than their ancestors. As a 'constitutional' monarchy our current royal family does not rule the country and has virtually no political power. Instead, the Queen's time is taken up with many ceremonial and formal roles, as well as public visits and speeches.

Queen Elizabeth II has reigned since 1952 after the death of her father, King George VI. She inherited her titles at the relatively young age of 25, which include Head of the Armed Forces and Head of the Commonwealth. With a combined Commonwealth population of over 129 million, she is theoretically a very powerful person.

"During Elizabeth's reign life has changed enormously"

Respect towards the Queen is still an important tradition and there is a strict etiquette on how to behave in front of Her Royal Highness. You must always smile in the presence of the Queen and never speak until spoken to first. Men must bow their heads and women must curtsy when the Queen greets you, and this may be accompanied by a handshake. She must be initially addressed as "Your Majesty", although if the conversation continues



Buckingham Palace, London, the Queens official residence

you can later refer to her as "Ma'am". It is also important never to show your back to the queen, so if leaving the room before her, you must walk out backwards.

The Queen still has a strong presence in England, although her popularity is widely debated since she is essentially powerless. Her name features in our national anthem (*God Save the Queen*) and her image appears on postage stamps, coins and banknotes. Her annual speech to the nation on Christmas Day is one of the few times the public get to hear her thoughts, and is watched by a large proportion of the country.

Buckingham Palace is the Queen's official London residence, where she spends most of her time. The palace has 775 rooms including the royals' living space, 188 staff bedrooms and 92 offices. The palace is very much a working building, with the offices of those who support the everyday activities and duties of The Queen and her immediate family. Queen Elizabeth is married to Prince Philip, the Duke of Edinburgh. Together they have four children, including the heir to the throne



Prince Charles, and eight grandchildren.

During Elizabeth's reign life has changed enormously. She has made every effort to modernise the image of the royal family including talking openly to the public. She was the first monarch to send her children to school, she chose to pay taxes, cut family costs and opened up Buckingham Palace to invited guests.

Fact Box

- The Queen must stay politically neutral and does not have the right to vote
- She is fluent in French and often speaks it when abroad
- She is well known for her love of the corgi breed of dog
- All but one of the Queen's married children have separated from their original partners
- The Queen is the only person in the UK who doesn't need a passport to travel abroad, since passports are issued in her name
- Her official limousines are the only cars in Britain to have no number plates



Daily Information

Student Programme		
08.00-09.00	Breakfast, your college	
09.45	BMS Lecture Theatre, Chemistry Department	
09.45 - 12.15	Cambridge Trail Competition	
12.15 - 14.00	Lunch, University Centre	
14.00 - 18.30	Cambridge Trail Competition	
19.00 - 20.30	Dinner, University Centre	

Mentor Programme		
07.30-09.00	Breakfast, College	
07.30 - 12.30	Theory Exam Translation, Examination Schools	
12.30 - 14.00	Lunch, Examination Schools	
14.00 - 22.00	Theory Exam Translation, Examination Schools	
19.00 - 23.00	Dinner and Ceilidh, Examination Schools	

Logic Problems

1. The Book

A woman walked up to a man behind a counter and handed him a book. He looked at it and said, "That will be four dollars." She paid the man and then walked out without the book. He saw her leave without it but did not call her back. How come?

2. The Truck Driver

A police officer saw a truck driver clearly going the wrong way down a one-way street, but not try and stop him. Why not?

3. A Popular Book

When the book first came out it was read only by a handful of very rich. Now almost everyone has a copy. But you cannot buy it in a bookstore or borrow it from a library. What is it?

Noticeboard

Timetable Change:

Cambridge Trail Competition Today, 9.45, BMS Lecture Theatre, **Chemistry Department**

Police, Fire, Ambulance





4. Bridge Crossing

5. Number Grid

numbers from 1

to 16 in the box

Arrange the

Cambridge

Sunny with showers, reaching a high of 20°C (68°F) and a low of 12°C (53°F). Chance of rain: 71% Wind Speed: 29 kph

112

Oxford

Sunny with showers, reaching a high of 21°C (69°F) and a low of 12°C (53°F).

Chance of rain: 86% Wind Speed: 29 kph

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A special thanks to the Departments of Zoology and Chemistry for the lab space, and Alfa Aesar for providing the chemicals.

Written and Produced ßluesci

Chris Adriaanse and Amy Chesterton Venus Oak (cover), Nathan Pitt Images

> Email catalyzer@bluesci.org

VARSIT



In wartime, an army had to cross a wide,

the bridge would have made them easy

army cross the river in relative safety?

murky river. There were no boats, and only

one bridge, which was very narrow. Crossing

targets for enemy gunfire. How did the entire

Find out the answers tomorrow

Yesterday's Answer: The German owns the fish.





JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Six: **Theoretical Exam**

There's one more chance to show off your chemistry knowledge. Today you'll sit the theoretical exam; heads down, pens poised.

As a special treat to celebrate the end of the exams, you head to London to dine in style. On the way there will be a chance to see some of the capital from the bus as we take a scenic route to our destination. Once arrived, you'll reunite with the mentors and unwind in the beautiful surroundings of the Natural History Museum.







London

THEY SAY you have to live in London once in your life. There's a certain inevitability to it. Some people stay and some people leave.

Over 7.5 million people call London home and its inhabitants are an integral part of what makes it work. As the capital city, London has always attracted people from all directions and walks of life. Together, they speak more

"London boasts more royal palaces than some entire countries" than 300 languages, infusing the city with their culture.

There's lots to see and do. Sounds of the latest music pour out of Victorian pubs and you can see experimental theatre on the stages built for Shakespeare. Pop along to the famous Savile Row and spend £1000 on a handmade suit, or grab a bargain in Camden market. Young and old architecture stands sideby-side, mixing 16th century Tudor houses with 60s concrete and modern glass buildings.

Traditional London is easy to find. Whether you want high tea at The Ritz with cucumber sandwiches followed by scones with strawberry jam, or to watch the changing of the



guard at Buckingham Palace, there's plenty that has stood the test of time. London alone boasts more royal palaces than some entire countries.

London also has beautiful open spaces – London's lungs. The nine royal parks cover a huge area of over 22 km², the largest being Richmond Park that is almost three times the size of New York's Central Park. London's skyline is also remarkably low compared to other major cities making the city feel homely while still being busy and bustling.

Today, you'll see some of the sights on the coach tour before arriving at the National History Museum. If anything tickles your fancy you'll get the chance to explore it for yourselves on Saturday.

The Royal Society

THE NAME 'Royal Society' doesn't give much away. If you've not heard of it before, chances are you will come across it (and hopefully one day be eligible to join) at some point in your scientific career.

The full name, 'The Royal Society of London for the Improvement of Natural Knowledge', gives a better indication of its purpose. The history of science since the 17th century is closely intertwined with the story of the Royal Society, even before the word *science* had its current meaning.

The Royal Society was founded in the mid 1600s by Christopher Wren, a designer, astronomer, geometer, mathematician-physicist and one of the greatest English architects in history. He wanted to found a group to encourage "Physico-Mathmaticall Experimentall Learning". Having given a lecture to some of his contemporaries, the idea was discussed and the society was born, and is now the world's oldest scientific academy in continuous existence.

Membership to the Royal Society is by election and only for the privileged few deemed by their peers to be the most eminent scientists of their day. Membership is a great privilege and members are allowed to have the letters FRS (Fellow of the Royal Society) after their name. Although membership is mainly for scientists from the United Kingdom, other Commonwealth countries and the Republic of Ireland. A small number of international members are also appointed. Currently 72 Nobel Prize winners are fellows, and this year 44 more were elected, increasing the total membership to 1346.

The Society's work is multifaceted, funding early career scientists and encouraging effective science and mathematics education in the UK. Next year the Society celebrates their 350th anniversary and will celebrate in style with a year-long series of events and exhibitions to get the public involved and raise the profile of science. They are also creating the International Science Policy



Sir Christopher Wren

Centre so that British and international policy makers have access to the best scientific advice available to help them make tough decisions.

Although their history is rich, their goal remains simple: "to inspire interest in the joy, wonder and excitement of scientific discovery", something we can all appreciate.

A Night at the Museum

TONIGHT IS the reunion dinner; a post-exam chance to unwind. Our venue is the Natural History Museum, where we'll dine alongside the museum's most famous attraction.

The museum stands on Exhibition Road in South Kensington, London. Often referred to as a 'Cathedral of Nature', it combines world renowned earth- and lifescience specimens with the ornate architecture of the building itself.

Although this lavish museum has been open for over 100

"One of the most famous exhibits is Dippy"

years, the history of its contents goes back further, when Sir Hans Sloane donated his personal collection of samples to the nation in 1753. A keen physician and collector, Sloane had gathered numerous plants, animal and human skeletons, which he wanted others to appreciate after his death.

The collection was handed over to the British Museum

and was added to by prominent scientists such as Darwin. Years later the collection got its own museum that today houses some 70 million items split into the five collections of; botany (plant life), entomology (insects), mineralogy (minerals), palaeontology (prehistoric life) and zoology (animals).

One of the most famous exhibits in the museum is 'Dippy' who'll be joining us for dinner. This replica *Diplodocus* skeleton has dominated the central hall for the last 104 years, welcoming millions of visitors. After his installation Dippy was so popular that museums throughout Europe requested copies of the display. He is part of the furniture and has seen many other favourites arrive at the museum.

Another popular display is the life-sized blue whale model. At the time of creation, it was the largest model in the world and had to be assembled entirely within the hall it now stands. Suspended from the ceiling parallel to a blue whale skeleton, the vast size is almost incomprehensible. The blue whale is the largest creature ever to have lived – and that's



Top: the Natural History Museum. Bottom: Large Mammal Hall.

including the dinosaurs!

A recent addition to the museum is Archie the giant squid. This creature was caught alive off the coast of the Falkland Islands in 2004. Although fairly common seadwellers, these animals are rarely found alive. Archie is an impressive display of an intact specimen. The squid measures 8.62 metres long and is kept as a 'wet specimen' in a large acrylic tank with preservatives.

Research still goes on at the museum, including identification, classification and conservation of specimens. With an enormous variety of samples and information, it is overflowing with countless new experiences. Perhaps none of us will forget our night at the museum... 📧



Archie being preserved

Dippy

Although Dippy has stood in the same place for over a hundred years, he recently changed his posture. The dinosaur's tail was lifted from the ground into a raised position following research which revealed that *Diplodocus* tails would have been raised high to balance the neck. That said, debate continues as to the precise position of the neck. Recent reports from the University of Portsmouth which studied the postures of living animals concluded that the upright position would have been held for the majority of the time. This research however isn't reason enough to change Dippy's stance. Museum dinosaur expert Dr Paul Barrett said, "It is not unreasonable to suggest that their necks may have been held in a vertical position for some of the time, but [*Diplodocus'*] lifestyles would have required necks with a wide range of movement, not least to reach down to drink water from ground level."











"We lost our pole during punting. We tried to paddle but couldn't and so had to drag ourselves by the grass on the bank. Because of our hard work we got extra points and ended up coming second!"

ISRAEL





Yesterday in pictures and thoughts on the Cambridge Trail





"I fell in the water. It was nice and warm but a bit filthy!"

DENMARK





"It was fun. I met a lot of new people and tried new things like punting and cricket"









The Mentors in Oxford

HERE IN Cambridge we've had a fun few days inbetween the exams. The mentors in Oxford however, have had less fun. Whilst we've been out enjoying the weather and seeing the sights, those in Oxford have been working away at translating the exam papers.

Despite the hard work, they have been graced with pleasant surroundings. The



A typical Ceilidh

mentors have been housed in the Examination Schools, the examination centre for Oxford University and specifically built for the job. With so many students needing to sit exams each year, the Examination Schools are one of the largest buildings of the university. During the exam period, up to 1200 students per day come and go for written examinations.

The building itself is very decorative, built over 100 years ago. Some traditions since still stand. Entry for students into the building is usually only permitted if they are wearing subfusc clothing (black and white), a tradition extinct in Cambridge but still enforced in Oxford.

This year's exams are already over so few students

can be seen walking the corridors, providing space for the mentors to translate the exams. Last night, their work was complete.

The exams have now been translated into each respective language and sat in Cambridge. To celebrate completion, the mentors had an evening dinner and a Ceilidh. A Ceilidh (pronounced 'kay-ley') is a traditional dance which began in the rural regions of Ireland and Scotland. This high energy dance is popular for social occasions as the music is cheerful and lively and couples are encouraged to dance together in groups. All the mentors paired up, and were taught the basic rules of skips, hops and steps. Then, as the band began to play, everyone stepped to the beat in their



Students in subfusc at the Examination Schools

respective groups.

The evening was a great way for the mentors to socialise, and everyone had a great time.

"This high energy dance is popular for social occasions"

Cambridge Jargon*

[*Jargon - The specialised language used by a trade, profession, or similar group.]

THE UNIVERSITY has acquired its own vocabulary over the years. Here's a small selection of some words that might come in handy during your stay.





Some definitions you won't find here

A Salt Solution

THE ABILITY to use salt to preserve food has been known for over 4000 years, providing a means to store food during the winter months and making it possible to trade perishable foods over long distances. During medieval times, and for centuries after, salt was one of the most valuable and essential commodities known to man.

The high price of salt was not due to a low abundance. Salt is of course found in sea

"Salt was once of the most valuable and essential commodities known to man"

water and rock deposits in many places. The problem was that purification methods were poor and could not meet demand, creating shortages well into the 19th century. Transportation costs were also high, giving salt a premium price and making it only available to the rich.

However, the high price was not sustainable. Salt has been replaced by advances in technology. Today we use fridges, freezers, additives and cans to preserve much of our food. So what happened to the Salters who made a living trading salt and its goods?

The Salters' Company, (a Trade Guild) originated in 1394 for the purpose of regulating the salt trade in London. Once the importance of salt diminished, the company having effectively lost its trade, founded the Salters' Institute for the purpose of assisting young chemists to complete their training following World War I.

Their support began a strong partnership with the chemical industry and scientific and educational institutions. Today the Salters' Institute aims to promote the appreciation of chemistry and related sciences among the young and to encourage careers in the teaching of chemistry in the UK and allied industries. The Institute's core activities are residential Salters'



Young scientists experimenting at the Salters' Festival of Chemistry



Above: a salt mine in Utah, USA. Right: salt ball from the Dead Sea

Chemistry Camps for 15 year olds and Salters' Festivals of Chemistry for 11-13 year olds – events which are hosted by Universities throughout the UK and Ireland. The Institute is also responsible for curriculum development, undertaken at the University of York.

The Company's activities today centre on charitable giving, and in addition to the Salters' Institute, annual donations are made to over sixty national charities. The Salters' Company Charity for the Relief of Need assists individuals in need and the Salters' Company Almshouses provide sheltered accommodation for elderly people in Maidenhead and Watford.

The Institute's focus on chemistry may seem surprising at first but it was logical. During the last few centuries salt had found a new role in chemistry, or more specifically, in the chemical industry. Things like hydrochloric acid, sodium hydroxide and bleach could now be produced on a large



scale. The chemical industry had been waiting for this to expand. The importance of salt was no longer to preserve our food but to supply chemicals to industry.

For the Salters' Company, the fall of the salt trade led to new directions and a strong alliance with the chemical

"Today the Salters' Institute aims to promote the appreciation of chemistry and related sciences"

industry and education that continues to this day. Salt is still a much needed mineral but its importance is no longer to preserve but as a new role in chemistry, or more specifically, in the chemical industry.

Daily Information

Student Programme					
06.45-08.00	Breakfast, University Centre				
09.00 - 14.00	Theoretical Exam, Guildhall				
14.30 - 15.30	Lunch, University Centre				
16.00	Bus Departure to London				
19.00 - 23.00	Reunion Dinner, Natural History Museum, London				
23.15	Return to Cambridge				

Mentor Programme						
07.30-09.00	Breakfast, College					
10.00	Bus Departure to London					
13.00 - 14.00	Lunch, Royal Society					
14.00 - 19.00	Free Time in London					
19.00 - 23.00	Reunion Dinner, Natural History Museum, London					
23.15	Return to Cambridge					

Using each of the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 once and only once, form two whole numbers; one of which is double the other (e.g. 23 and

It takes 3 minutes for a bath to fill with both taps on and the plug in. It takes 5 minutes for the bath to empty with the taps off and the plug out. How long will it take for the bath

to fill with both taps on and the plug out?

On the grid (right) the four parts have been

moved around. The partitions are exactly the same as those used above. Explain.

46, but of course this not the solution).

Problem Page

1. Digitizer

2. On tap

Noticeboard

Olympiad Help

Police, Fire, Ambulance

+44 7909 893283 +44 7900 405698

112

Don't forget your calculators, rulers and pens for today's exam.



of 19°C (66°F) and a

Oxford

Cambridge Showers with a high

low of 11°C (51°F). Chance of rain: 86% Wind Speed: 16 kph

Showers with a high of 22°C (71°F) and a low of 11°C (51°F). Chance of rain: 12% Wind Speed: 19 kph

London Sunny intervals with a high of 22°C (71°F) and

a low of 14°C (57°F). Chance of rain: 72% Wind Speed: 14 kph





Where does this 'hole' come from?

Find out the answers tomorrow

Yesterday's Answers: 1) She was returning an

overdue library book 2) The truck driver was walking



3. Can this be true?

Written and Produced **Production Consultant**

Chris Adriaanse and Amy Chesterton Michael Derringer Yin Tung HO(cover), Nathan Pitt and Caroline Hancox (centre-fold) Beth Ashbridge catalvzer@bluesci.org

3) The book is a telephone directory

4) They waded across the river,

which was only six inches deep.





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THE SALTERS' INSTITUTE





A special thanks to St John's School for loan of sports equipment.

Images Sub-Editor Email





JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Seven: Go Ape!

Our closest ancestors can often be seen on nature documentaries playing high in the tree-tops, or swinging from branch to branch. This athletic behaviour is often mimicked by children, keen to build tree-houses or dens out of the view of suspected bad-guys. Today's activity is designed to rekindle some of your inner desires, as we head off to a wooded location for a spot of monkey business...





Logo Explained

Many of you will have noticed this year's Olympiad logo. But have you wondered what it is? Well, here's the answer...

The image is an occupied orbital diagram of the molecule S_2CO , and was calculated from an ab initio calculation using the software programme HyperChem. You'll probably never come across this particular molecule again as it is highly unstable, rapidly dissociating into sulfur and carbon monoxide.

The atoms were chosen not for their stability but to give the right overlap as to create an '800' from the nodal structure, to commemorate that this year is the 800th anniversary of the University of Cambridge. The colours were chosen as those of the Universities of Oxford and Cambridge who are jointly hosting the event.





Review: Theory Exam

THE WEATHER prediction was clouds and showers, but Thursday morning was bright and crisp. Delegates arrived early and clustered outside the Guildhall entrance, laughing, joking and seemingly calm.

What awaited their arrival inside the halls were neat rows of tables, each with a large brown envelope containing their scripts and instructions.

At 8.50 the doors opened and the students flooded in. Newly made friends and team mates genuinely passed on good luck to each other as they parted ways at the entrance,

"There were six title questions"

streaming off into their respective halls.

As the enormity of what lay ahead dawned, the noise level began to fall. A low murmur of mixed languages endured as last minute snacks were grabbed and stationary sorted.

At 9am everyone was in their seats and a large green sign signalled 'start'. Frantic rustling of envelopes commenced, followed by the quick shuffling of paper, and then silence. The exam had begun.

There were six title questions: an estimation of Avogadro's constant, the interstellar production of hydrogen, protein folding, synthesis of Amprenavir, epoxy resins and transition metal





complexes; each broken down into manageable sections.

The paper was perceived as long, and difficult to complete in the given time, "More time would have meant more points" said Sweden, "The time given was absolutely too short". Japan agreed, "We didn't have enough time, if we had, then the paper would have been OK".

Most agreed that equal weighting was given to physical, organic and inorganic chemistry. Each student had their favourite section, "The organic part was great. It was like solving a mystery from the clues" said Thailand. "I managed all of the physical questions with pleasure. I don't know if I did them correctly, but it was enjoyable" said Armenia. Others were less fortunate. "I was hoping for electrochemistry questions but there weren't any" said Sweden.

As it is necessary to distinguish between the brightest young chemists, the theoretical exam was extremely challenging. Most were left nervous as the papers went to be marked, yet relieved that the exams were over, *"Now* it feels like the summer holidays have started" said Poland.

The overall result is now beyond anyone's control, and whether it's good or bad news, you should feel confident in the knowledge that you've done your best. Ac

Adrenaline

WE'VE ALL experienced fear: Butterflies begin in your stomach followed by the development of sweaty palms, a dry mouth, and a deafening, pounding heart. Whether you're walking down a dark alleyway, or facing your phobia, the symptoms are the same. This is the feeling that thrillseekers thrive on. The cause is the hormone adrenaline, and it is how our bodies respond to stress.

Surprisingly, this simple compound (see figure) was only discovered a little over 100 years ago after its isolation from the kidneys of animals. Merely three years later a synthetic route was discovered and companies began manufacturing and selling the compound. Almost immediately adrenaline was in high demand, hailed as a 'wonderdrug' throughout the 20th century for its various effects on the body and has been an essential addition to modern medicine.

Adrenaline gives us a momentary increase in physical performance, allowing a stronger and faster response to a fight or flight situation. This release during a dangerous or unexpected environment is evolutionary

"Adrenaline suppresses all non-emergency body functions" favoured as it helps escape potentially fatal circumstances and is common to all mammals.

Once released naturally or taken artificially, adrenaline is distributed via the blood stream stimulating a response from the cells it comes into contact with. The drug's detection boosts the supply of oxygen and glucose to the brain and muscles. The heart is forced to work harder, increasing its power and rate. Overall the blood supply is increased, evident by a raised blood pressure and pulse. The air passages of the lungs dilate as the lungs work overtime to increase the oxygen supply.

These natural responses can be used to treat a wide range of problems, including cardiac arrest, other heart problems and asthma. The presence of adrenaline also suppresses all non-emergency body functions such as digestion and the immune system for a limited amount of time. This stimulated reduction in immune response has been so successful that adrenaline is used to treat anaphylactic



Some adrenaline junkies getting their fix

shock – a condition whereby the patient has had a hypersensitive allergic reaction to an allergen, which without medication is potentially fatal.

All three conditions are still treated with adrenaline, as well as many others, which would be complicated without it. So next time you're feeling anxious, take your mind off the situation by thinking of the complex chemistry going on inside you, and how the simple chemical which makes your stomach flutter has saved many lives!

Discovery

Japanese chemist Jokichi Takamine was the first to isolate and purify adrenaline. He derived the name 'adrenalin' (note the absence of the 'e') from the Latin for 'on the kidney' signifying the location of the animal gland used. A year later Takamine was awarded the name as a USA trademark. Adrenaline (with an 'e') became the worldwide chemical name, although in the US, the Greek derived name of epinephrine was adopted to eliminate confusion.



Daily Information

Student Programme					
Times are	Breakfast, your college				
each team.	Go Ape				
guide.	Dinner, University Centre				

Mentor Programme						
07.30-09.00	Breakfast, Robinson College					
09.00 - 12.30	Marking					
12.30 - 14.00	Lunch, Robinson College					
14.00 - 18.30	Marking					
19.00 - 20.30	Dinner, Robinson College					
20.30 - 22.00	3rd Jury Meeting, Robinson College					

Noticeboard

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Cambridge Rain with a high of 17°C (62°F) and a low of 10°C (50°F). Chance of rain: 69% Wind Speed: 24 kph

Whoops! Chemistry by Accident

Health and safety is taken very seriously in chemistry laboratories, but this has not always been the case...

Cyclamate

Michael Sveda was working in a University of Illinois laboratory in 1937. Determined to solve the synthesis he was working on, he decided to have his cigarette-break in his lab.

With only two hands, it was often necessary to put his cigarette down, sometimes accidently in the anti-fever medication he was working on. After being on the bench, Sveda noticed that his cigarette tasted incredibly sweet – he had discovered the sweetener cyclamate.

Cyclamate is the sodium or calcium salt of cyclamic acid, a popular sweetener until it was suspected to be a possible carcinogen.

Today its use is banned in many countries, but in others is often listed with the additive code E952.

Aspartame

The sweetener aspartame was discovered in a very similar instance some thirty years later.

James M. Schlatter was working for a company searching for a formula to treat ulcers and heartburn. Schlatter knew better than to smoke in the lab, but not to avoid putting his fingers in his mouth! After licking his finger one day he got an incredible shock – the substance he was working on was 200 times sweeter than sugar.

Aspartame's sweetness has led to its popularity, as it is required in such low quantities it does not add calories to the food product.

Since its approval in 1974 it has been the subject of much controversy but is still an ingredient in approximately 6,000 consumer foods and beverages worldwide.

meet because their angles aren't the same. The difference is so small that it's hard to tell

a space equal to one square is created.

with the naked eye, but when the shapes move

Answers to Yesterday's Problems

1) 6729 and 13458

- 2) Seven and a half minutes
- 3) The hypotenuse is not a straight line. There is a small kink where the red and blue triangles



Written and Produced Production Consultant Images

Email

Chris Adriaanse and Amy Chesterton Michael Derringer Matthew Dearing (cover) and Caroline Hancox catalyzer@bluesci.org



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UNIVERSITY of CAMBRIDGE





STILLINE ST

JOURNAL OF THE 41^{5T} INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Eight: London

Now's your chance to be let loose on London! After seeing the capital from the coach tour, it's time to explore it yourselves.

We'll get dropped off in Greenwich, from which you can both stay and relax, or head into the city – the choice is yours. Better plan you're day wisely though, with so much to do, it's hard to choose where to spend your time!

Quality Control

IF YOU'VE EVER studied something made of gold or silver such as jewellery or tableware, you'll have noticed small markings - or hallmarks. These signify the item's origin and the quality of the precious metal. Hallmarks have been used for centuries to protect the public from fraud and are one of the oldest forms of consumer protection, dating back to the 14th Century.

Gold, platinum and silver are too soft to be useful in their pure form and so are alloyed with copper or other metals to increase their strength. Hallmarking is therefore necessary to indicate their purity.

"Hallmarking is one of the oldest forms of consumer protection"

Today's standard requires a minimum of three symbols. The first is the sponsor's or maker's mark, usually consisting of at least two letters within a shield. The second signifies the purity, a three digit number that tells you the fraction of pure metal in the sample in the millesimal fineness scale (out of 1000). For example, a mark of 750 on a gold piece of jewellery tells you that its purity is 75%. In another more well-known measure of purity, the carat, this equals 18-carat gold (24-carat being pure gold). The third mark belongs to the assay office that hallmarked the sample and

assayed (tested) the material to determine its purity.

The practice of assaying ores and alloys has been conducted for centuries. Fire assaying is the traditional method and still remains one of the most accurate ways to determine gold content (see box). This method is destructive so it is not practical for many

items, and has been supplemented by modern techniques such as x-ray analysis to non-destructively measure the content of fine or decorative items.

Londor

(+)

Birmingham

×

Today, there are four remaining assay offices in the UK that can hallmark metals: Sheffield Edinburgh, Sheffield, Birmingham (the 盟 world's largest) and London. Perhaps Edinburgh the most famous of these is the London office

belonging to The Worshipful Company of Goldsmiths - or the Goldsmiths' Company for short. They were the original assay office in the UK who were given instructions by King Edward I in 1300 to go out into London workshops and assay the silver and gold being used in the city.

Fire Assaying

Fire assays are done by placing the gold sample, ore or alloy in a hot furnace (~500°F) with some lead. The metals melt, and the lead and gold from an alloy. On cooling, the remaining impurities are easily discarded leaving the alloy behind. The lead-gold mix is then reheated in the furnace. When the metals melt, the clay pot absorbs the lead, leaving the pure gold behind which can be weighed.



Today, they authenticate and hallmark nearly 25,000 items each year. They are also responsible for ensuring the coins that the Royal Mint produce conform to the required standards.

Goldsmiths' Company also has a strong relationship with Cambridge. Towards the end of the 19th century many people had an

interest in metallurgy and in particular the physical properties of gold and its alloys. Two keen chemists, Francis Henry Neville and Charles Thomas Heycock, started doing experiments in their free time in a lab set up in Sidney Sussex College. Their insightful work on a number of alloys, including the structure of a gold-sodium alloy, attracted attention and in 1908 led to Goldsmiths' funding a readership that prompted the University to

"There are four remaining assay offices in the UK"

recognise metallurgy as a suitable subject to be studied.

The relationship continues to this day with investment over the years, paying for the first metallurgical laboratory in 1919. An increase of funding elevated the readership to a professorship (now held by Anthony Cheetham) and, following a merge by the departments of metallurgy and materials science has now become the Goldsmiths' Professors of Materials Science. And as the new department relocates to a new site in the west of Cambridge, Goldsmiths' are once again providing a helping hand.



Naming the Elements

THE NAMING of elements used to be simple. In the ancient world there were seven planets and seven metals. Their names were inspired accordingly: gold for the Sun, silver for the moon, and the remaining known four planets for tin, lead, copper and mercury.

The ancient alchemists found new elements while trying to turn lead into gold and began assigning names based on different influences.

New elements were assigned names from wherever they pleased. Cesium took its name from the colour of its flame, caesius is Latin for "sky blue colour". Gallium was named after the Latin for France, the home nation of its discoverers but it was the famous French chemist, Antoine Lavoisier, who started to name the elements and their compounds in a more systematic manner.

"Names should differ as little as possible in other languages"

Lavoisier named oxygen from the Greek for 'acid former'. Oxygen was later found to be present in many acids but not all, but the name stuck. His brilliance as a chemist was mirrored by his determination to have a proper method to name substances, which gave birth to our modern system.

The complicated and involved process of nomenclature (the systematic

assignment of names) is now the realm of the International Union of Pure and Applied Chemistry.

IUPAC does more than tell us how to name our hydrocarbons, it unites the academic, industrial and public sectors. The organisation was formed because of the need to standardise chemistry internationally and has since become the authority on nomenclature, terminology, standardised methods for measurement, atomic weights and many other critically evaluated data.

IUPAC is also assigned the job of approving names suggested for new elements that are discovered. Names should differ as little as possible in other languages and be based on practicality and prevailing usage. The lab that discovers the new element puts forward their suggestion which IUPAC must approve. Recent elements have been named after some famous scientists: curium, einsteinium, mendelevium and nobelium.

New elements are still being discovered. The strange symbols at the bottom of the periodic table's p-block such as Uup or Uuh are the systematic names given to unknown and unnamed elements, only some of which are predicted to be stable.

Earlier this year IUPAC recognised the existence of element 112 that is currently called Ununbium. Just last week the discoverers announced their choice of name: 'copernicium' with the

"Earlier this vear IUPAC recognised the existence of element 112"

element symbol 'Cp' in honour of scientist and astronomer Nicolaus Copernicus (1473-1543). IUPAC has until the end of the year to consult with other scientists and make the final decision.

The element was first reported in 1996 by Centre for Heavy Ion Research, Darmstadt in Germany. However, don't expect to be doing any experiments with 'copernicium' in the near future. Only tens of atoms have ever been made and have a half-life of less than a microsecond. Although it was thought that the element might have interesting properties due to the importance of relativistic effects on the electronic structure as the electrons near the core approach the



speed of light, the reactivity of 'copernicium' is similar to Mercury.

Labs across the world are still competing to find and characterise new elements, numbers 114, 116 and 118 have also been reported. So if you've ever dreamed of doing chemistry with your-name-ium, you'll have to discover it first! CA



Sigurd Hofmann, head of the international team of scientists discovering element 112.





"Awesome. The feeling of freedom on the zip slide and in the forest was incredible."





Yesterday in pictures and thoughts on Go Ape!









"The slides were really fun, especially watching people fail to land."









"We got very muddy"

"We couldn't

land"

USA









"It was perfect. Very exciting, especially the bike ride. We took the 10 am bus so we got a lie-in."

Things to do in London

With so little time in London it's hard to choose what to do. Here are some key highlights. Ultimately the choice is yours - just make sure you are at Temple station on time to get picked up!

Kensington Culture

Greenwich \rightarrow South Kensington by train and tube: 45 minutes

THE AREA around South Kensington is packed with museums covering a huge array of subjects. At South Kensington tube station you'll be greeted by the 'Albertopolis', a tunnel that leads to all the museums in the area, so pick a museum and follow the arrows. The museums have free entry but may charge for some exhibitions.

The Science Museum prides itself on bringing "science to life and life to science". Exhibitions focus on many aspects of science, technology and medicine, ranging from the industrial revolution right through to space travel. The museum currently has a collection of over 300,000 pieces, and special free exhibitions on: *Plasticity - 100 years of making plastics, Fast Forward: 20 Ways Formula 1 is Changing Our World,* and *Future Foods*. Also, with prices starting from £8, you can watch science films and documentaries in 3D at the spectacular IMAX cinema.

You will have no doubt seen much of the **Natural History Museum** from the Olympiad reunion dinner. If you want a second look, why not head back. The museum is home to many life and earth science specimens within five main collections: botany, entomology, mineralogy, palaeontology and zoology. Check out their temporary exhibition on Charles Darwin *After Darwin: Contemporary Expressions* which costs £6.

The Victoria and Albert Museum (V&A) is the world's largest museum of decorative arts and design with a permanent collection of over 4.5 million pieces. The collection spans 5000 years of art, from ancient times to the present day, from a number of different cultures around the world. The V&A currently has a free special exhibition entitled *Telling Tales: Fantasy and Fear in contemporary design*.

South Kensington \rightarrow Temple, by tube: 15 minutes





City Sights

Greenwich \rightarrow London Bridge by train: 15 minutes

A WALK ALONG the Thames is a great way to see London's most famous landmarks as well as a few lesser known ones. It takes about an hour to walk from London Bridge to Westminster, taking in such sights as Shakespear's Globe Theatre, The London Eye and Big Ben.

Just minutes from London Bridge station are the Tate Modern gallery and the Millennium Bridge. The view across the bridge to St. Paul's cathedral is particularly impressive. Shortly after opening, the bridge attracted the nickname 'the wobbly bridge' after the large number of people crossing it in its first few days caused it to sway from side to side!

The area of the South Bank around the National Theatre plays host to various street entertainers. There are dancers and musicians of all styles, street painters, human statues and other imaginative performances the likes of which you'll never have seen before.

Continuing west, it is a pleasant walk along either river bank to Westminster where you will find the Houses of Parliament, Westminster Abbey and Downing Street.

Westminster \rightarrow Temple by tube: 10 mins.



From the River

Greenwich Pier \rightarrow Westminster or Embankment by boat: 1 hour

IF YOU WOULD prefer to give your legs a rest, a cruise along the river is a relaxing way to take in a lot of the sights and will set you back around £3-8. Tickets are available from Greenwich Pier. Depending on the ticket, you will be able to hop on and off at any stop you like.

Once at Westminster, it is only a short walk or tube journey to Buckingham Palace and three of London's excellent parks, including the huge Hyde Park.





Greenwich in Green

SPENDING SOME time in Greenwich itself is a quiet way to spend the day. A very leafy suburb of London, it is home to over 50 parks, from formal gardens to wild meadows. The view across London from the Royal Observatory in Greenwich Park is magnificent.

There are also plenty of places to eat and drink, and a number of markets to explore. Greenwich market is near the National Maritime Museum and sells arts and crafts and a variety of foods.

The National Maritime Museum celebrates the importance of the sea, ships, time and stars, and their relationship with people. It includes the Royal Observatory, which has the Greenwich meridian line. This line represents the prime meridian of the world – Longitude 0°. Everywhere on Earth is measured in terms of its distance east or west from this line.

The Greenwich meridian line was originally established by Sir George Airy in 1851 and by 1884 it was used by two thirds of ships as the reference meridian on their maps. After being recognised as the official prime meridian, it has since been renamed the meridian line.

Neptune court is located at the heart of the museum and is a relatively new addition. It houses the museum's jewels of gold and brass. The Upper Deck is a dramatic glass-ceilinged mezzanine gallery.

Greenwich \rightarrow Temple by train and tube: 30-40 minutes



41st | International Chemistry Olympiad

Daily Information

Student Programme					
08.00 - 09.00	Breakfast, your college				
09.30	Bus Departure to Greenwich, London				
11.00 - 15.30	Free time				
16.00	Bus Departure from Temple Underground Station				
19.00 - 20.30	Dinner, University Centre				

Mentor Programme					
07.30-09.00	Breakfast, Robinson College				
09.00 - 12.30	Arbitration, Robinson College				
12.30 - 14.00	Lunch, Robinson College				
14.00 - 18.30	Arbitration, Robinson College				
19.00 - 20.30	Dinner, Robinson College				
20.30 - 22.00	4th Jury Meeting, Robinson College				

Noticeboard

41st IChO Office Department of Chemistry Lensfield Road Cambridge CB2 1EW United Kingdom

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	+44 (0)7900 40569
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Web	www.icho2009.co.uk



<u>_____</u>

Cambridge Cloudy and sunny spells with a high of 19°C (64°F) and a low of 10°C (50°F). Chance of rain: 5% Wind Speed: 11 kph

London

Cloudy and sunny spells with a high of 23°C (73°F) and a low of 12°C (53°F). Chance of rain: 3% Wind Speed: 14 kph









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Department for Innovation, Universities & Skills



UNIVERSITY of CAMBRIDGE

Calling All Chemistry Olympians... check out the world's first community-based online chemistry platform

SCIENTISTS ARE all too aware that it's essential to know what you're doing. And it's important to know quickly. Whether you're studying for exams or researching in a lab, the internet provides access to a vast wealth of information and data but with so much out there it's not always easy to find what you're looking for.

One new database for chemistry is ChemSpider, originally started by a group of friends in a basement, coding on computers built from spare parts, much like Google,



YouTube and Facebook. ChemSpider has become the world's biggest free search engine for chemists. The user-friendly interface allows students and researchers to search for any chemical entity, returning information such as structure, properties and suppliers. And all importantly, it takes a matter of seconds. So if you need to know the melting point of aspirin or want to know the difference between propanone and acetone - ChemSpider can help.

ChemSpider cannep. ChemSpider is unique - engaging its community of users to publish their own chemistry and show it to the world, users can curate, validate and annotate all of the information that is on the site...information associated with over 20 million compounds from over 200 data sources.

Keen to increase online resources, the Royal Society of Chemistry recently acquired Chemspider and is re-launching the website this summer. This aims to be the primary internet resource for chemistry, and it's free and easy to use.

Take a spin around the Web of Chemistry on ChemSpider as a user or contribute to help build the world's best chemistry community platform by visiting: www.chemspider.com



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Chris Adriaanse and Amy Chesterton Farzana Miah and Will Whyles (London) Frans van Rijnswou (cover), Chris Adriaanse and Nathan Pitt (centre-fold) catalyzer@bluesci.org







JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Day Nine: Closing Ceremony

The closing ceremony marks the end of the Olympiad, and recognises the hard work everyone has put in. It seems like we've only just arrived and yet it's almost time to leave.

The week has brought new experiences to all; whether it's your first time in the UK, your first time at an Olympiad or your first time attempting one of the activities. There have been new faces and new cultures but all with a common interest in chemistry.

Housed in the outstanding architecture of King's College chapel, we will celebrate another successful year of chemistry and bid you a safe journey home.

Reflections The week in words

Group Photo Alongside vitamin B12

New Beginnings at the Old Place



O Year is indeed a very special one. We have definitely taken the first step, a rather successful one I hope, for another 40 years of wonderful history of the IChO. But that is not the whole reason. It is far more special for us because we are taking part, in person, in the historical celebration of the 800th Anniversary of Cambridge University.

We certainly admire the reputation and prestige which Cambridge has been able to acquire through such a long history. Nevertheless we believe that success may not always be proportional to length of time. With the 260 bright students who are here with us in Cambridge and the many more at home, we can create another wonderful history for a better world in the future.

On behalf of every participant, I would sincerely like to express our gratitude for the hospitality and generosity on the part of the organizers here in Cambridge. Most of all, we are deeply grateful to Peter and the science committee for successfully implementing our new syllabus without any struggle. We certainly enjoyed cool but unpredictable weather here in Cambridge!

Dun Huran Lee

Duckhwan Lee, Chair of the IChO

Reflections on this Year's Olympiad

MY INVOLVEMENT in the 41st IChO started just over a year ago, but for the main organisers, planning the Olympiad began long before that. When I competed as a student in 2004 and 2005 I didn't realise how much work goes into the preparation. Everyone has put in such a lot of time – however, seeing everything happening more or less smoothly has made all the effort worthwhile.

Hosting an event like the IChO is a chance to show off a city, a country and its people to the rest of the world. We wanted to give you a taste of British culture, history and cuisine as it really is, rather than how it is portrayed in the guide books.

The pantomime at the Opening Ceremony hopefully shattered any illusions you might have had about British people being tediously formal and always having a stiff upper lip. Guided tours of Cambridge and then Belvoir Castle showed off our proud history, while sporting activities hopefully helped distract you from any preexam nerves.

I was worried about the cricket part of the Cambridge Trail, but luckily all the students proved to have physical as well as mental aptitude – the Portuguese in particular left me wondering why their country doesn't feature more prominently in Test Match cricket. Afterwards, a few intrepid souls even came with me down to the river to watch rowers competing in the Bumps, another peculiar Cambridge event.

'Go Ape' isn't really a traditional British activity, but nobody seemed to mind as we clambered, swung and zip-wired our way through Thetford Forest. On Saturday, you all got to decide your own plans – whatever you chose to do, I hope you had a good time.

As we reach the end of the Olympiad, I hope you have all enjoyed your stay in the UK, however well you did in the exams. The last time I attended an IChO I was given two things at the closing ceremony: a gold medal and a list of contact details for the other students I had met and befriended. Of these, the piece of paper was infinitely more valuable than the chunk of metal, so do take the time to keep in touch with the friends you have made during the past week.







Chris Kerr



Chris Kerr was a participant in the 2004 and 2005 IChO, winning a silver and then gold medal for the UK. He has just graduated from Cambridge with a degree in natural sciences having specialised in chemistry, and will stay on for a PhD in nanotechnology.



Daily Information

Student Programme					
08.00 - 09.00	Breakfast, your college				
09.00 - 12.00	Free time				
12.15 - 16.00	Lunch, University Centre				
14.30 - 16.30	Closing Ceremony, King's College				
17.00 - 18.00	Closing Banquet Reception, King's College				
18.00 - 20.00	Dinner				
20.00 - 23.30	Party and Disco				

Noticeboard

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Mentor Programme Breakfast, Robinson 07.30-09.00 College 09 00 - 12 00 Free time Lunch, Robinson 12:15 - 14:00 College Closing Ceremony, 14.30 - 16.30 King's College **Closing Banquet** 17.00 - 18.00 Reception, King's College 18.00 - 20.00 Dinner 20.00 - 23.30 Party and Disco



Cambridge

Cloudy with sunny spells reaching a high of 19°C (64°F) and a low of 14°C (57°F). Chance of rain: 81% Wind Speed: 19 kph

Poetry Corner

After practising your English for a week, we think you're ready for the next level. Read this poem to see a few of the inconsistencies and challenges of English pronunciation.

I take it you already know Of tough and bough and cough and dough? Others may stumble, but not you, On hiccough, thorough, lough and through. Well done! And now you wish, perhaps, To learn of less familiar traps?

Beware of heard, a dreadful word That looks like beard and sounds like bird. And dead: it's said like bed, not bead – For goodness sake, don't call it deed! Watch out for meat and great and threat (They rhyme with suite and straight and debt) A moth is not a moth in mother, Nor both in bother, broth in brother, And here is not a match for there, Nor dear and fear for bear and pear. And then there's dose and rose and lose – Just look them up – and goose and choose. And cork and work and card and ward. And font and front and word and sword. And do and go and thwart and cart. Come, come, I've hardly made a start!

A dreadful language? Man alive, I'd mastered it when I was five!

This poem is of unknown origin and lacks a title, but is attributed to a mysterious 'T.S.W.'



Written and Produced Production Consultant Images

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JOURNAL OF THE 41st INTERNATIONAL CHEMISTRY OLYMPIAD, CAMBRIDGE

Final Issue: Results

Congratulations to all those who took part in this year's Olympiad. Well done to everyone who received a metal.



Gold

Ruibo Assaf Hung-I Vlad Jihoon Naoya **Baptiste** Oleg Yang-Ting Do Ji DaoBo Robert Chih-Cheng Taavi Kenichi Hsu-Hang Ri Aria Daniil Xinchen Bahdan Ivan Chau Yixiao Julia Zhi Hao Martin

Wang Mauda Yang Puscasu Kim Ozawa Haddou Salnikov Chen Kim Liu Wang Pollice Yeh Pungas Endo Yeh Oh Samiei Khokhlov Huang Ranishenka Chernyshov Vu Wang Batki Gani Strebl

China Israel Taiwan Romania Korea Japan France Russia Taiwan Korea China Singapore Austria Taiwan Estonia Japan Taiwan Korea Iran Russia China **Belarus** Russia Vietnam U.S.A. Hungary Singapore Germany

41st International Chemistry Olympiad UK, July 2009

Silver

Dominik Bill Dávid Wenchi Abhishek Nathan Ondřej Ali Brian Marcin Florian Abdurrahman Alberto Robert Yuqun Alif Atsuhiro Egle Soma Pinnaree Constantin lan Shruti Gleb Igor Peter Marcin Maciej Xiao Bogdan Colin Matthias Amanmyrat Anh Mathieu Iman Fangzhi Pacharapon Asparouh Huseyin Oliver Yair Levindo Joel Sasilada Ignas Charlie Vinavak Petra Manikanta Quang Romans Jason Ivana

Stefanko Huang Katona Liu Padmanabhan Benjamin Henych Mashreghi Seifried Warminski Berger Turksoy Lena Owen Lin Noikham Nakajo Maksimaviciute Zsoter Tea-mangkornpan Giurgiu Houlsby Khatri Široki Novozhilov Bullock Malinowski Sienkiewicz Xiao Ardan Lu Schmid Abdullayev le Dartiailh Abbaspour Jia Sinchairojkul Lilov Erguven Funabazama-Barcenás Litman Garcia Quarto Lawson Sirirungruang Anikevicius McTernan Gagrani Vizjak Kotaru Lu Nguyen Čaplinskis Kong Polim

Slovakia Australia Hungary China India U.S.A. Czech Republic Iran U.S.A. Poland Germany Turkey Italy United Kingdom Singapore Thailand Japan Lithuania Hungary Thailand Romania United Kingdom India Estonia Russia United Kingdom Poland Poland Singapore Ukraine U.S.A. Germany Turkmenistan Vietnam France Iran Australia Thailand Canada Turkey Mexico Argentina Brazil New Zealand Thailand Lithuania United Kingdom India Croatia India Vietnam Latvia Australia Indonesia

Bronze

Dzmitry Yeong Seok Christoph Andriv Ladislav Kelvin Melih Konstantin Simon Johannes Bening Adhitya Liudmila Artur Mohammad Hadi Khakrand Luca Iryna Zhalgas Andriy Aya Petr Dimas Mehman Jan Tamás Eric Yorck Brian Furkat Tudor Algirdas Nicolas Connie Nazar Leif Tobias Dilmurat Filip Pavel Alberto Daniel Eduardo Jarkko Arthur Olli Wepa Hsiao-Chen Allan Igor Hiram Jared Ilya Pavol Alexander Kristian Grevsen

Shakhno Cha Krumpeck Neshchadin Hovan Cheung Baci Krautgasser Luca Hellwagner Muhammad Moeliadi Budanitskaya Stachowiak Zucchini Barodzich Serimbetov **Bolbat** Eizawa Motloch Abdillah Fikri **Bunvatov** Orkisz Vörös Coomes Mohr Salvati Mukhtarov Balan Neniskis López Abdala Zhao Mammedov Schelin Iveland Moldobaev Vranješević Švec Branchi Quill Romero-Montalvo Järvelä Reis Lainiala Roziyev Jan Thor Marković Borbolla Hernández Lewis Skripin Ondrisek

Belarus Korea Austria Ukraine Slovakia Australia Turkey Austria Romania Austria Indonesia Indonesia **Belarus** Poland Iran Italy **Belarus** Kazakhstan Ukraine Japan Czech Republic Indonesia Azerbaiian France Hungary Canada Germany Argentina Kazakhstan Romania Lithuania Argentina Canada **Turkmenistan** Sweden Norway Kyrgyzstan Croatia Czech Republic Italy Ireland Mexico Finland Brazil Finland Turkmenistan New Zealand Denmark Croatia Cuba New Zealand Kazakhstan Slovakia

Denmark

Oleg Toghrul Evitar Gabriel Alexander Christos Hyun-Sun Mikael Vladimiras Ondřej Jose Agil Saman Valeriu Robinzon Huong Gankhulug Uyanga Jeremy Martin João Victor Tim Kadi Liis Gareth David Ernesto Aigerim Nayha

Vybornyy Almammadov Degani Hernández-Fernández Blokhuis Anastassiades Roh Twengström Oleinikovas Hák Montero Bastidas Azimzada Zia Scutelnic Ramos-Madrigal Le Gansukh Dagvadorj Witmer Martinov Magalhães Caminha Evers Saar Gamble Rodríguez San Miguel Aguilar Infante Shamshidin Enver

Ukraine Azerbaijan Israel Mexico Netherlands Cyprus New Zealand Sweden Lithuania Czech Republic Peru Azerbaijan Pakistan Moldova Mexico Vietnam Mongolia Mongolia Canada Bulgaria Brazil Netherlands Estonia Ireland Spain Cuba Kazakhstan Pakistan

Honourable Mention

Mišin

Luka Tino Thibaut Yngve Matin Christian Maksim Jernej Luca

Andrejčič Canziani Grouy Guttormsen Huseynli Jensen Repas Schneller-Pavelescu Apetrei Spain

Slovenia

Belgium

Norway

Azerbaijan

Denmark

Estonia

Slovenia

Switzerland

The Medals

- 1. The reversel depicts a stylised DNA molecule with a chain of hydrogen-bonded water molecules. It was designed by Philip Nathan, a specialist coin and medal designer.
- 2. The shield of the University of Cambridge.
- 3. Logo of the Department of Industry, Universities and Skills (DIUS).
- 4. The Leopard's Head hallmark of the Goldsmiths' Company (see article in Issue 8).
- 5. The shield of the University of Oxford.
- 6. The coat of arms of the Royal Society of Chemistry.
- 7. The shield of the Royal Society of Chemistry. The central symbol represents the sun surrounded by symbols for the ancient planets on a benzene ring, representing the seven metals known to the early alchemists.
- 8. The Latin motto of the Royal Society of Chemistry *Pro scientia et humanitate*. An agreeable and almost literal translation is *for the sake of knowledge and for the benefit of mankind*.

The Element Song

As requested by many of this year's Olympians, here are the words to 'The Element Song' by Tom Lehrer.

There's antimony, arsenic, aluminum, selenium, And hydrogen and oxygen and nitrogen and rhenium, And nickel, neodymium, neptunium, germanium, And iron, americium, ruthenium, uranium, Europium, zirconium, lutetium, vanadium, And lanthanum and osmium and astatine and radium, And gold and protactinium and indium and gallium, And iodine and thorium and thulium and thallium.

There's yttrium, ytterbium, actinium, rubidium, And boron, gadolinium, niobium, iridium, And strontium and silicon and silver and samarium, And bismuth, bromine, lithium, beryllium, and barium.

There's holmium and helium and hafnium and erbium, And phosphorus and francium and fluorine and terbium, And manganese and mercury, molybdenum, magnesium, Dysprosium and scandium and cerium and cesium. And lead, praseodymium, and platinum, plutonium, Palladium, promethium, potassium, polonium, And tantalum, technetium, titanium, tellurium, And cadmium and calcium and chromium and curium.

There's sulfur, californium, and fermium, berkelium, And also mendelevium, einsteinium, nobelium, And argon, krypton, neon, radon, xenon, zinc, and

rhodium, And chlorine, carbon, cobalt, copper, ungsten, tin, and

sodium.

These are the only ones of which the news has come to Havard,

And there may be many others, but they haven't been discavard.



Written and Produced Production Consultant Images

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Department for Innovation, Universities & Skills

THE SALTERS' INSTITUTE



UNIVERSITY of CAMBRIDGE

International Examinations



ßluesci

rank	First name	Family Name	Country	Grand tot.	Prac. tot.	Theory tot.	award
				out of 100	out of 40	out of 60	
1	Ruibo	Wang	China	92.8	36.2	56.7	Gold
2	Assaf	Mauda	Israel	91.3	36.8	54.5	Gold
3	Hung-I	Yang	Taiwan	91.0	34.6	56.4	Gold
4	Vlad	Puscasu	Romania	89.5	35.0	54.5	Gold
5	Jihoon	Kim	Korea	88.7	35.6	53.0	Gold
6	Naoya	Ozawa	Japan	88.6	34.4	54.2	Gold
7	Baptiste	Haddou	France	86.0	33.9	52.1	Gold
8	Oleg	Salnikov	Russia	85.5	30.0	55.5	Gold
9	Yang-Ting	Chen	Taiwan	84.6	35.7	48.9	Gold
10	Do	Kim	Korea	84.4	30.8	53.6	Gold
11	Ji	Liu	China	83.3	28.5	54.8	Gold
12	DaoBo	Wang	Singapore	82.7	29.7	53.0	Gold
13	Robert	Pollice	Austria	82.6	27.2	55.4	Gold
14	Chih-Cheng	Yeh	Taiwan	82.3	31.1	51.1	Gold
15	Taavi	Pungas	Estonia	81.1	27.4	53.7	Gold
16	Kenichi	Endo	Japan	80.7	29.2	51.4	Gold
17	Hsu-Hang	Yeh	Taiwan	79.4	26.6	52.7	Gold
18	Ri	Oh	Korea	79.3	28.7	50.5	Gold
19	Aria	Samiei	Iran	79.3	25.3	53.9	Gold
20	Daniil	Khokhlov	Russia	79.2	23.5	55.7	Gold
21	Xinchen	Huang	China	79.0	26.5	52.5	Gold
22	Bahdan	Ranishenka	Belarus	78.9	25.7	53.2	Gold
23	Ivan	Chernyshov	Russia	77.6	23.8	53.9	Gold
24	Chau	Vu	Vietnam	77.5	24.0	53.4	Gold
25	Yixiao	Wang	U.S.A.	77.5	32.6	44.9	Gold
26	Julia	Batki	Hungary	77.5	31.4	46.0	Gold
27	Zhi Hao	Gani	Singapore	77.4	28.2	49.3	Gold
28	Martin	Strebl	Germany	76.6	31.3	45.3	Gold
29	Dominik	Stefanko	Slovakia	76.1	29.0	47.0	Silver
30	Bill	Huang	Australia	76.0	28.3	47.7	Silver
31	Dávid	Katona	Hungary	75.9	23.7	52.2	Silver
32	Wenchi	Liu	China	75.8	25.1	50.7	Silver
33	Abhishek	Padmanabhan	India	75.8	20.9	54.9	Silver
34	Nathan	Benjamin	U.S.A.	75.5	27.9	47.6	Silver
35	Ondřej	Henych	Czech Republic	75.2	25.9	49.3	Silver
36	Ali	Mashreghi	Iran	74.9	24.4	50.5	Silver
37	Brian	Seifried	U.S.A.	74.6	31.4	43.2	Silver
38	Marcin	Warminski	Poland	74.6	33.1	41.5	Silver
39	Florian	Berger	Germany	74.5	31.3	43.2	Silver
40	Abdurrahman	Turksoy	Turkey	74.3	26.1	48.2	Silver
41	Alberto	Lena	Italy	73.9	33.1	40.8	Silver
42	Robert	Owen	United Kingdom	73.8	27.1	46.6	Silver
43	Yuqun	Lin	Singapore	73.7	28.0	45.6	Silver
44	Alif	Noikham	Thailand	73.4	30.8	42.7	Silver
45	Atsuhiro	Nakajo	Japan	73.3	31.7	41.6	Silver
46	Egle	Maksimaviciute	Lithuania	73.2	33.3	40.0	Silver
47	Soma	Zsoter	Hungary	73.2	24.9	48.3	Silver
48	Pinnaree	Tea-mangkornpan	Thailand	73.2	23.6	49.6	Silver
49	Constantin	Giurgiu	Romania	73.1	25.5	47.6	Silver
50	Ian	Houlsby	United Kingdom	72.3	31.7	40.6	Silver
51	Shruti	Khatri	India	72.3	28.3	43.9	Silver
52	Gleb	Široki	Estonia	72.2	25.0	47.3	Silver

rank	First name	Family Name	Country	Grand tot.	Prac. tot.	Theory tot.	award
				out of 100	out of 40	out of 60	
53	Igor	Novozhilov	Russia	72.0	23.0	48.9	Silver
54	Peter	Bullock	United Kingdom	71.8	29.6	42.2	Silver
55	Marcin	Malinowski	Poland	71.7	22.1	49.6	Silver
56	Maciej	Sienkiewicz	Poland	71.7	33.1	38.5	Silver
57	Xiao	Xiao	Singapore	71.4	30.6	40.8	Silver
58	Bogdan	Ardan	Ukraine	71.4	23.9	47.5	Silver
59	Colin	Lu	U.S.A.	71.2	26.4	44.7	Silver
60	Matthias	Schmid	Germany	71.2	27.6	43.6	Silver
61	Amanmyrat	Abdullayev	Turkmenistan	71.1	30.1	41.0	Silver
62	Anh	Le	Vietnam	70.0	24.3	45.7	Silver
63	Mathieu	Dartiailh	France	69.6	22.3	47.3	Silver
64	Iman	Abbaspour	Iran	69.4	24.7	44.7	Silver
65	Fangzhi	Jia	Australia	69.3	19.9	49.4	Silver
66	Pacharapon	Sinchairojkul	Thailand	68.9	18.0	50.9	Silver
67	Asparouh	Lilov	Canada	68.9	30.3	38.6	Silver
68	Huseyin	Erguven	Turkey	68.8	23.6	45.2	Silver
69	Oliver	Funabazama-Barcenás	Mexico	68.1	34.8	33.3	Silver
70	Yair	Litman	Argentina	68.0	32.2	35.9	Silver
71	Levindo	Garcia Quarto	Brazil	67.9	21.6	46.3	Silver
72	Joel	Lawson	New Zealand	67.9	32.2	35.7	Silver
73	Sasilada	Sirirungruang	Thailand	67.9	25.8	42.0	Silver
74	Ignas	Anikevicius	Lithuania	67.8	33.2	34.6	Silver
75	Charlie	McTernan	United Kingdom	67.5	27.6	39.9	Silver
76	Vinayak	Gagrani	India	67.1	16.5	50.5	Silver
77	Petra	Vizjak	Croatia	66.9	24.6	42.3	Silver
78	Manikanta	Kotaru	India	66.6	17.3	49.3	Silver
79	Quang	Luu Nguyen	Vietnam	66.5	24.7	41.8	Silver
80	Romans	Čaplinskis	Latvia	66.3	19.3	47.0	Silver
81	Jason	Kong	Australia	66.0	21.1	44.9	Silver
82	Ivana	Polim	Indonesia	65.4	21.4	44.0	Silver
83	Dzmitry	Shakhno	Belarus	65.0	18.8	46.2	Bronze
84	Yeong Seok	Cha	Korea	64.9	18.7	46.2	Bronze
85	Christoph	Krumpeck	Austria	64.4	25.7	38.7	Bronze
86	Andriy	Neshchadin	Ukraine	64.0	23.8	40.2	Bronze
87	Ladislav	Hovan	Slovakia	63.8	26.9	37.0	Bronze
88	Kelvin	Cheung	Australia	63.7	23.8	39.9	Bronze
89	Melih	Baci	Turkey	63.6	22.4	41.2	Bronze
90	Konstantin	Krautgasser	Austria	63.4	31.6	31.8	Bronze
91	Simon	Luca	Romania	62.9	16.2	46.7	Bronze
92	Johannes	Hellwagner	Austria	62.8	28.6	34.2	Bronze
93	Bening	Muhammad	Indonesia	62.7	22.6	40.1	Bronze
94	Adhitya	Moeljadi	Indonesia	62.6	22.1	40.5	Bronze
95	Liudmila	Budanitskaya	Belarus	62.2	19.2	43.0	Bronze
96	Artur	Stachowiak	Poland	62.1	16.4	45.7	Bronze
97	Mohammad Hadi	Khakrand	Iran	62.0	20.8	41.3	Bronze
98	Luca	Zucchini	Italy	62.0	21.5	40.5	Bronze
99	Iryna	Barodzich	Belarus	61.7	20.9	40.8	Bronze
100	Zhalgas	Serimbetov	Kazakhstan	61.5	19.8	41.7	Bronze
101	Andriy	Bolbat	Ukraine	61.3	22.6	38.7	Bronze
102	Ауа	Eizawa	Japan	60.4	23.6	36.8	Bronze
103	Petr	Motloch	Czech Republic	60.4	21.0	39.4	Bronze
104	Dimas	Abdillah Fikri	Indonesia	60.3	16.6	43.6	Bronze

rank	First name	Family Name	Country	Grand tot.	Prac. tot.	Theory tot.	award
				out of 100	out of 40	out of 60	
105	Mehman	Bunyatov	Azerbaijan	60.2	21.4	38.8	Bronze
106	Jan	Orkisz	France	59.9	19.4	40.6	Bronze
107	Tamás	Vörös	Hungary	59.9	29.6	30.3	Bronze
108	Eric	Coomes	Canada	59.8	24.1	35.8	Bronze
109	Yorck	Mohr	Germany	59.5	22.5	37.1	Bronze
110	Brian	Salvati	Argentina	58.7	26.1	32.6	Bronze
111	Furkat	Mukhtarov	Kazakhstan	58.7	24.8	33.9	Bronze
112	Tudor	Balan	Romania	58.5	16.8	41.7	Bronze
113	Algirdas	Neniskis	Lithuania	58.3	22.5	35.8	Bronze
114	Nicolas	López Abdala	Argentina	57.4	26.6	30.7	Bronze
115	Connie	Zhao	Canada	57.3	24.2	33.1	Bronze
116	Nazar	Mammedov	Turkmenistan	57.1	13.9	43.3	Bronze
117	Leif	Schelin	Sweden	57.1	21.0	36.2	Bronze
118	Tobias	Iveland	Norway	56.4	22.1	34.3	Bronze
119	Dilmurat	Moldobaev	Kyrgyzstan	56.4	10.7	45.7	Bronze
120	Filip	Vranješević	Croatia	55.6	15.6	39.9	Bronze
121	Pavel	Švec	Czech Republic	55.3	20.1	35.2	Bronze
122	Alberto	Branchi	Italy	55.3	26.4	28.9	Bronze
123	Daniel	Quill	Ireland	55.1	25.9	29.2	Bronze
124	Eduardo	Romero-Montalvo	Mexico	54.1	17.4	36.7	Bronze
125	Jarkko	Järvelä	Finland	53.8	23.8	30.0	Bronze
126	Arthur	Reis	Brazil	53.8	20.4	33.3	Bronze
127	Olli	Lainiala	Finland	53.7	31.9	21.8	Bronze
128	Wepa	Roziyev	Turkmenistan	53.6	16.2	37.4	Bronze
129	Hsiao-Chen	Jan	New Zealand	53.2	23.3	30.0	Bronze
130	Allan	Thor	Denmark	52.6	21.5	31.1	Bronze
131	Igor	Marković	Croatia	52.5	19.9	32.6	Bronze
132	Hiram	Borbolla Hernández	Cuba	52.4	19.5	32.9	Bronze
133	Jared	Lewis	New Zealand	52.3	29.2	23.1	Bronze
134	Ilya	Skripin	Kazakhstan	52.0	19.7	32.3	Bronze
135	Pavol	Ondrisek	Slovakia	52.0	28.3	23.7	Bronze
136	Alexander Kristian	Grevsen	Denmark	51.8	25.3	26.5	Bronze
137	Oleg	Vybornyy	Ukraine	51.5	12.3	39.3	Bronze
138	Toghrul	Almammadov	Azerbaijan	51.4	13.6	37.8	Bronze
139	Evitar	Degani	Israel	51.0	17.0	34.0	Bronze
140	Gabriel	Hernández-Fernández	Mexico	50.9	15.2	35.7	Bronze
141	Alexander	Blokhuis	Netherlands	50.8	19.2	31.5	Bronze
142	Christos	Anastassiades	Cyprus	50.7	18.2	32.6	Bronze
143	Hyun-Sun	Roh	New Zealand	50.7	24.2	26.5	Bronze
144	Mikael	Twengström	Sweden	50.5	17.8	32.6	Bronze
145	Vladimiras	Oleinikovas	Lithuania	50.3	17.6	32.7	Bronze
146	Ondřej	Hák	Czech Republic	50.2	22.6	27.6	Bronze
147	Jose	Montero Bastidas	Peru	50.0	14.3	35.6	Bronze
148	Agil	Azimzada	Azerbaijan	49.7	10.0	39.7	Bronze
149	Saman	Zia	Pakistan	49.3	22.1	27.2	Bronze
150	Valeriu	Scutelnic	Moldova	49.3	19.9	29.3	Bronze
151	Robinzon	Ramos-Madrigal	Mexico	49.2	23.4	25.7	Bronze
152	Huong	Le	Vietnam	49.2	19.1	30.0	Bronze
153	Gankhulug	Gansukh	Mongolia	47.8	21.1	26.7	Bronze
154	Uyanga	Dagvadorj	Mongolia	47.7	23.4	24.3	Bronze
155	Jeremy	Witmer	Canada	47.0	15.7	31.3	Bronze
156	Martin	Martinov	Bulgaria	46.7	22.3	24.4	Bronze

rank	First name	Family Name	Country	Grand tot.	Prac. tot.	Theory tot.	award
				out of 100	out of 40	out of 60	
157	João Victor	Magalhães Caminha	Brazil	46.4	12.6	33.9	Bronze
158	Tim	Evers	Netherlands	46.4	19.7	26.6	Bronze
159	Kadi Liis	Saar	Estonia	46.1	20.7	25.4	Bronze
160	Gareth	Gamble	Ireland	46.0	14.9	31.1	Bronze
161	David	Rodríguez San Miguel	Spain	45.8	20.4	25.4	Bronze
162	Ernesto	Aguilar Infante	Cuba	45.6	14.6	31.1	Bronze
163	Aigerim	Shamshidin	Kazakhstan	45.6	13.1	32.5	Bronze
164	Nayha	Enver	Pakistan	45.6	20.7	24.9	Bronze
165	Yngve	Guttormsen	Norway	44.7	20.9	23.8	Honourable Mention
166	Matin	Huseynli	Azerbaijan	44.5	19.5	25.0	Honourable Mention
167	Luka	Andrejčič	Slovenia	44.4	21.7	22.7	Honourable Mention
168	Christian	Jensen	Denmark	44.2	20.0	24.2	Honourable Mention
169	Maksim	Mišin	Estonia	44.2	14.4	29.9	Honourable Mention
170	Luca	Schneller-Pavelescu Apetrei	Spain	44.2	21.5	22.6	Honourable Mention
171	Tino	Canziani	Switzerland	44.0	17.2	26.8	Honourable Mention
172	Thibaut	Grouy	Belgium	43.8	13.4	30.3	Honourable Mention
173	Jernej	Repas	Slovenia	43.5	18.9	24.6	Honourable Mention
174	Garreth	McCrudden	Ireland	43.5	16.4	27.1	
175	Mengxian	Li	Sweden	43.5	23.6	19.9	
176	Bariscan	Cimen	Turkey	43.4	14.2	29.2	
177	Thalys	Rodrigues	Brazil	43.3	22.6	20.7	
178	Isabelle	Girard	France	42.9	13.4	29.6	
179	Edvard	Sargsyan	Armenia	42.7	8.4	34.3	
180	Marek	Vician	Slovakia	42.0	17.6	24.5	
181	Anders	Jørgensen	Denmark	41.9	18.4	23.5	
182	Tibor	Stolz	Switzerland	41.8	21.3	20.6	
183	Sergio	Perez Conesa	Spain	41.8	11.7	30.2	
184	Luis	Cabrera Sosa	Peru	41.8	15.2	26.6	
185	Nika	Anžiček	Slovenia	41.7	19.6	22.1	
186	Sohbet	Hojamuhammedov	Turkmenistan	41.6	8.6	33.0	
187	Roberts	Bluķis	Latvia	41.5	25.2	16.3	
188	Daniel	Averbuj	Argentina	41.4	17.1	24.3	
189	Riccardo	Laterza	Italy	41.1	13.1	27.9	
190	Sarvar	Khaidarov	Kyrgyzstan	40.8	13.3	27.5	
191	Rafael	Prato Modestino	Venezuela	40.8	17.4	23.4	
192	Andris	Cāns	Latvia	40.7	20.7	20.1	
193	Kristian	Weibye	Norway	40.5	22.0	18.5	
194	Jennimari	Koskela	Finland	40.2	18.6	21.6	
195	Charis	Demetriou	Cyprus	39.9	13.7	26.1	
196	Sebastian	Sanchez Falero	Peru	39.3	15.4	24.0	
197	Sebastiaan	Koenders	Netherlands	38.9	16.7	22.2	
198	Dan	Negrescu	Moldova	38.8	12.4	26.4	
199	Amarsanaa	Davaasuren	Mongolia	38.6	8.6	30.0	
200	Maria Angeles	Garcia Ferrero	Spain	38.5	13.6	24.9	
201	Ciaran	Coney	Ireland	37.3	19.9	17.4	
202	Laura	Avena	Latvia	37.2	17.5	19.7	
203	Diogo	Teixeira	Portugal	37.2	20.1	17.1	
204	Anna	Stimkovskaia	Moldova	36.7	13.9	22.8	
205	Leandro	Marques	Portugal	36.5	18.0	18.5	
206	Kristina	Kučanda	Croatia	36.4	14.6	21.8	
207	David	Ahlstrand	Sweden	36.3	13.3	23.0	
208	Eirik	Hauge	Norway	35.8	16.4	19.4	

rank	First name	Family Name	Country	Grand tot.	Prac. tot.	Theory tot.	award
				out of 100	out of 40	out of 60	
209	Michael	Michelachvili	Israel	35.8	13.6	22.2	
210	Dimitrios	Ntalampekos	Greece	35.6	17.7	17.9	
211	Jan	Bütikofer	Switzerland	35.3	21.2	14.1	
212	Yordan	Georgiev	Bulgaria	35.3	16.5	18.7	
213	Neta	Kaspin	Israel	34.9	13.0	21.9	
214	Sigtryggur	Kjartansson	Iceland	34.5	16.8	17.7	
215	Michalis	Georgiou	Cyprus	34.4	16.4	18.1	
216	Lianne	Jansen	Netherlands	33.7	19.1	14.6	
217	Bilal	Shahid	Pakistan	33.6	16.6	17.0	
218	Kristján	Rögnvaldsson	Iceland	33.4	12.2	21.2	
219	Dobri	Dobrev	Bulgaria	33.4	15.4	18.0	
220	Stefan	Angelov	Bulgaria	33.2	8.1	25.1	
221	Namuuntuul	Dulguun	Mongolia	32.7	15.9	16.7	
222	João	Sousa	Portugal	32.4	17.6	14.8	
223	Guðmundur	Stefánsson	Iceland	32.0	18.0	14.0	
224	Asad	Rehman	Pakistan	31.3	9.7	21.6	
225	Juha	Siitonen	Finland	30.5	19.5	11.0	
226	Pedro	Salvador	Portugal	30.2	18.2	11.9	
227	Yannick	Engelmann	Belgium	29.8	16.3	13.5	
228	Valérie	Voorsluijs	Belgium	29.2	7.7	21.5	
229	Marco	Huarancca Ninanya	Peru	28.8	7.5	21.3	
230	Zoi	Chatzieleftheriou	Greece	28.7	11.4	17.4	
231	Vahagn	Tamazyan	Armenia	28.6	9.7	18.8	
232	Alfredo	Mora	Venezuela	28.2	12.5	15.6	
233	Rutger	Callens	Belgium	28.0	5.0	23.0	
234	Smbat	Mkhitaryan	Armenia	28.0	12.4	15.6	
235	Iordanis	Savvidis	Greece	27.8	10.0	17.8	
236	Artur	Aslanyan	Armenia	27.1	5.3	21.8	
237	Helgi	Björnsson	Iceland	27.0	14.0	13.0	
238	Vasilis	Ioannou	Cyprus	27.0	11.5	15.5	
239	Marija	Malgaj	Slovenia	26.2	6.6	19.5	
240	Sagynbek	Dadybaev	Kyrgyzstan	24.9	4.1	20.8	
241	Daniela	Oreggioni	Uruguay	21.8	13.0	8.8	
242	Dimitrios	Patsatzis	Greece	21.1	1.2	19.8	
243	Alexandr	Vanovski	Moldova	17.0	5.0	12.0	
244	Virginie	Greppin	Switzerland	16.5	0.0	16.5	
245	Hessah	Alquraishi	Kuwait	11.1	5.7	5.4	
246	Lorena	Larrea	Uruguay	9.9	5.6	4.3	
247	Juan	Pellegrini	Uruguay	8.5	0.6	7.9	
248	Ahmad	Mohammad	Kuwait	6.3	0.6	5.7	
249	Abdulaziz	Almutawa	Kuwait	4.7	0.9	3.9	
250	Munirah	Aljasem	Kuwait	3.1	1.3	1.7	