

# **Guidelines for prospective organisers of an International Chemistry Olympiad**

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## **1. Introduction**

These are general guidelines for prospective organisers of an IChO based upon the compilation by Jan Apotheker (organisation chair of the 34th IchO), the reports of the working groups in Warsaw, Neusiedl and Smolenice and a 2003 Hungarian proposal.

This document should be edited and updated by regularly so that future organisers can use it. It should be available to all interested parties.

This version was discussed during the meeting of the steering committee of December 2003 in Kiel.

These guidelines are just recommendations and suggestions that reflect current (and hopefully best) practice. They refer to and elaborate on the regulations of the IChO. The regulations must be adhered to at all times. However, these guidelines do not form part of the regulations and they are not binding to either party. If they cannot be adhered to or there is a better way of doing things, then the organisers and the International Jury should decide the issue.

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## **2. General timetable for organisers**

### **Before application**

The basic question is whether there is enough support for the organisation of an IChO.

Necessary support must come from organisations such as:

- Ministry of education
- National chemistry union
- University
- Chemical industry
- National (chemistry) teachers association

The application to host should happen preferably at least 3 years ahead, submitting a letter to the steering committee (naming the contact person of the organisers).

### **Finances**

The cost of organising the IChO depends among other things on the country where it is held and the number of participants.

In Denmark it was about 900 k\$, in India about 300 k\$, in the Netherlands about 1,200 k€, in Greece 420 k€. Germany has a budget of 1,400 k€.

There must be adequate financial guarantees before applying to organise an IChO.

## **Venues**

Before formulating an application to host an Olympiad it must be clear which venue is to be used for the practical examination. With the growing number of participants, (240 in 2003 increasing to 260 in 2009), lab space is an important consideration.

A basic idea about the housing of students and mentors must also be available. Each country sends 4 students. The number of people accompanying the students is about 3 per country.

## **Organisation**

You need a solid background within an organisation that will serve as the base for the activities. The chair of the organisation should be tied to that organisation in some form.

Several committees need to be formed:

- *an organising committee*, with a number of people responsible for different tasks. Each of the subcommittees is represented on this committee. This is the committee that is formed first and makes all of the decisions.
- *a scientific committee*, responsible for the preparatory and competition problems and exam correction
- *a recommendation committee*, for financial and other support you need. It has no function, but consists of the local mayor, governor, national minister or president, royalty, university rector, Nobel Prize winners etc. They can support any application you make. They make life easier.

## **Year minus 3**

The application to the steering committee has been accepted.

The chair of the organisation is now a member of the steering committee. He or she will report in December on the first steps of the organisation.

At this time there should be

- A firm commitment of financial support.
- A definite venue for the practical exam and theoretical exam
- A chair of the scientific committee
- An organisation committee
- A first tentative timetable of the IChO (See suggestions in part 5)

## **Year minus 2**

By this time the venues have to be reserved.

The scientific committee should have started its work.

The logo of the Olympiad has been decided upon.

Decisions on the excursions need to be made. Most things will be available about two years ahead of time.

Contacts must be made with the government.

Checks should be made which officials or royalty will be present during the opening or closing sessions.

Membership of all committees must be established

## Last year

During the prior Olympiad Catalyzer 1 is distributed. The flag of the Olympiad is taken along from the Olympiad. You are now the official site of the Olympiad.  
After the prior Olympiad, the website goes live.

Registration is organised through the head mentor for each country. Therefore the organising committee must know this person. This is done by sending them a letter in September, or by checking at the prior Olympiad.

The head mentors receive an invitation by December. In a number of cases, to be indicated by the mentors, an additional invitation must be sent to the ministry of education or the national chemical society.

The mentors should send back:

- The names of the adults accompanying the team.
- The names of the team participants.
- Their travel schedule.

September, first draft of prep problems should be ready.

In December a steering committee meeting is hosted and the venues are presented.

The preparatory problems without the worked solutions are published on the web in January. Hard copies with solutions are sent to each head mentor.

In January it should be clear what glassware, chemicals and solutions are needed during the practical exam.

Around February the first teams have reacted.

By May the final version of both exams should be ready and tested.

Around May/ June you will receive the travel plans and the names of the students.

You will need at least two weeks to prepare the labs for the practical exam.

During the Olympiad you will have to provide for three groups of guests:

- Students (4 per country) + 1 guide for each team
- Mentors and scientific observer (3 per country)
- Paying guests at the discretion of the organiser (about 5%).  
They include the observers from future participants. Some countries prefer if they are called observers.

The list of tasks is not over with the olympiad: a report of the event needs to be prepared.

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## 3. Necessary amenities

### **The Catalyzer**

An editorial board is needed for the Catalyzer. This board may also create other publications. During the Olympiad you need a photographer, and a few writers.

The Catalyzer should appear daily during the Olympiad.

The last Catalyzer contains the allocation of the medals and should be available at the closing ceremony. The Olympiad is a competition between individuals, not countries, so country rankings are not included in this document.

One of the Catalysts should contain the addresses of mentors and students.

During the last three Olympiads a number of articles were prepared beforehand, e.g. concerning famous national chemists.

## **Guides**

For each team a guide is needed who stays with the students at all times. Generally it is better to get a guide who speaks good English than a guide who speaks the native tongue of the students poorly.

## **Lab assistants**

These assist during the lab exams. You need about 1 for every 8 students. They should be aware that they would not have a common language with quite a few students. Anyhow there should not be any communication with the students except in the case of an emergency.

## **Buses**

It can speed up transportation if people are assigned to the same bus throughout the Olympiad. In addition a person responsible for each bus can be useful.

## **General assistants**

In the mentors' venue helpers for all sorts of tasks (5 persons or so) come very handy.

## **Handbag and materials**

It has become customary to give all participants a handbag or rucksack, containing general information, a T-shirt, a notepad, writing equipment, and a calculator. The latter are to be used during the exams. This way the checking of the calculators is avoided. The pens should leave a mark that makes visible copies.

## **Name tags**

All participants should wear a colour-coded tag, with their name, their country and their function (student, mentor etc). These labels also contain a small program for the Olympiad. The labels for the students should indicate their code e.g. NL-1, US-2, etc. The head mentor should also be indicated.

## **Catering**

Care should be taken with all meals. Because the standard diet of the various countries differs tremendously, and for some religions, there are food restrictions, a variety of food should be served. It is important to label the content of the foods served. Pork and beef is not always suitable for everybody. Vegetarian food should be made available. The breakfast also should suit both western and Asian style diets

## **The computer network**

For the translation of the final text of each exam into the language used by the students a computer is made available for each country.

Computers should use Windows and Microsoft Word as a base. The programs to edit schemes, diagrams and structures should also be there to allow the translation of the captions.

If a country has special requirements, like an azerty-keyboard, they have to take them themselves. It should be possible to use a laptop on the network.

You need to have a special team that can make any necessary repairs.

## **Copying facilities**

50.000-100.000 ( $10^5$ ) pages of paper could be used during the Olympiad. High-speed copiers (with backup) and enough personnel are necessary to meet the tight deadlines. Avoid stapling and low quality paper (for auto-feed).

## **4. The work of the scientific committee.**

### **Membership**

In the past one of the high-ranking chemistry professors of the organising country has chaired the committee. The members should be academic staff in different fields of chemistry with an excellent command of English.

An experienced mentor must also be a member of the scientific committee. This person would make sure that the problems generated by the committee fit into the regulations of the IChO.

### **Timetable**

The scientific committee should have at least two years to work on the exams. In Holland several meetings/ weekends were organised to develop both the preparatory problems and the exams.

During the first meeting the whole committee was briefed on the nature of the Olympiad and informed of the role that the scientific committee members play during the Olympiad. I would like to stress the importance of such a briefing. The role of the jury and the importance of the jury sessions must be emphasised.

During the two years, there should be a regular contact between the committee and the organising committee.

### **Preparatory problems**

About 200 hard copies of the prep problems are needed.

The hard copy or the website should contain a copy of the current regulations including the syllabus. The committee should take care that the examinations are consistent with the prep problems. Special care should be taken about the number of level 2 and level 3 problems. If a problem using a level 3 topic is used in the exam, a problem using that concept MUST be included in the prep problems.

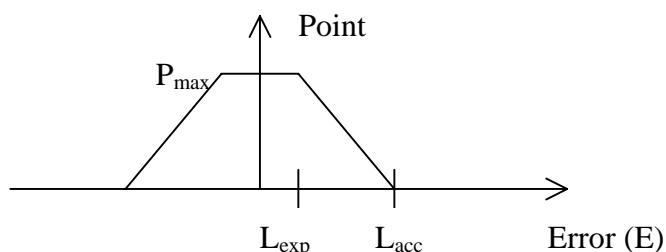
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### **Practical exam**

All experiments to be done in the practical exam should be thoroughly checked beforehand under the conditions experienced during the practical examinations. It is wise to have more than one qualified persons perform the experiments during the exam as well. When considering the quantities that are to be supplied and the time to be allotted to the tasks, remember that the competitors are high school students who are inexperienced lab workers.

Theoretical questions in the practical, if any, should pertain to the essence of the experiment.

Every effort has to be made to ensure that individual workbenches are equivalent.



It is possible to have the laboratory sessions split. That is, a morning session and an afternoon session can be held for all. Laboratories can also be rotated in two sessions. The reservations expressed to the latter system are that students must be strictly separated and that the organisers must insure that the equipment has been properly cleaned and dried if it is being reused.

Labelling of containers in the lab should be done using formulas when possible.

If there are reagents for common use of students, care should be taken to avoid cross-contamination. Common use of equipment or materials should be avoided if possible

If there is equipment for common use, a system should be in place that minimises waiting time and provides fair use (e. g. sign-up list monitored by supervisors)

There have been problems in the past with time required for the drying of a product/melting point determinations. Sometimes this has been overcome by lab staff making the measurements after the students have left

If experimental results are to be graded a scheme should be made for grading that is based on prior results. A sliding scale proved to be the best solution in this case. That is:

- Full marks should be awarded if the result is in a range that reflects the values expected by the examiners. The expected theoretical value must come from the analytical procedure performed on the exam day.
- No marks should be given to results outside the limits of acceptable values. Both ranges, expected and acceptable should reflect the examiners experiences.
- Between these two, a linear scale should be applied.

Numerically:  $P_{\max}$  points,

if  $0 \leq |E| \leq L_{\text{expected}}$

0 points

if  $L_{\text{accepted}} \leq |E|$

$$P_{\max} \left( 1 - \frac{|E| - L_{\text{exp}}}{L_{\text{acc}} - L_{\text{exp}}} \right)$$

if  $L_{\text{expected}} \leq |E| < L_{\text{accepted}}$

( $P_{\max}$  – maximum points, E – error, L – range limits)

Graphically:

Typical values for a titration would be

$L_{\text{expected}} = 0.5\%$  relative error in the volume.

$L_{\text{accepted}} = 3\%$  relative error in the volume.

Ranges should not necessarily be symmetrical.

Students should be allowed to decide the number of parallel measurements (titrations). Only the final value (probably a mean) as reported by the student should be graded. Marks should depend on experimental values, but not on precision. If necessary, the results should be recalculated uniformly.

Errors in the calculations should invoke a minor penalty, the magnitude of which should be suggested by the organisers and approved by the International Jury.

Serious mistakes in applying the rules of evaluation of experimental errors can be penalised (e.g. number of significant figures differs in more than two digits from the correct, rounding errors exceeding accuracy) Magnitude of the penalty should be suggested by the organisers and approved by the International Jury.

Students can be penalised for replaced samples or replenishing of reagents.

## Theoretical exam

The authors should remember that the contestants are high school students. The tasks should focus on using the fundamentals of chemistry in a unique way that requires thinking. The emphasis should be on Chemistry, not on mathematics. The length of the exam should be such that students will have time to attempt to answer all questions. There should be a balance between the classical areas of chemistry.

Not fully correct solutions should also be considered for partial marking. A detailed marking scheme should be presented with the exam to the International Jury. Points for partial solutions are best decided by the organisers using common sense during correction and they should be awarded uniformly as all possible errors can not be pointed out beforehand. The Jury should only discuss partial marks in the most critical cases.

E.g.: If the question is to provide a balanced chemical equation, then partial credit should be awarded to those who know the reaction partners, but fail to balance correctly.

Students are asked and are expected to show their work. This will help awarding partial marks. There should not be a penalty for failing to do so clearly, as long as the results are correct. That is, if a student omits some, possibly trivial steps, or uses a different solution, he has to receive full marks, if the results explicitly asked for are correct. However, if just the result of a complicated problem is given without any explanation, no points are due. Full marks should be awarded for a question, if the student solves it correctly and consistently using a faulty result from another question. There is no double penalty.

## Responsibilities of the authors of the problems during the Olympiad

- The author of the experimental tasks must present safety information to the students prior to the practical exam. This must include the demonstration of the use of unfamiliar equipment.
- The authors of both the experimental and theoretical problems must be present for discussion with the mentors before the jury sessions. They must also attend the jury session during the discussion of their problem.
- The authors must be available during the exams, to solve any unforeseen problems on the spot.
- After the examinations, the answer sheets must be copied at least two times. One copy is used for marking by the authors, the other for marking by the mentors. The original must be kept safe. During arbitration it must be available.
- The authors grade the answer sheets. After arbitration the marks are final. This grading takes a lot of time. The same goes for the recording of the individual scores of the students. Care should be taken that the name and the code for the student is unambiguous. The final scores must be made available for the mentors for a last check.
- The scientific committee checks the grades and tries to find the cuts for the medal allocation. It pays to amplify the results to get a larger cut. A possible formula that can be used is:  $e^{\frac{\text{score}}{10}}$  You can vary the number you use for the division to get a better result.
- Extra prizes could be given for the best theoretical work and for the best practical work, but an extra prize for the best female student is not recommended.
- During the closing session the chair of the scientific committee presents the results of the exams. He also discloses the cuts for the allocation of the medals.

## **5. Day by day organisation of the different items on the program.**

### **Day 1**

#### **Arrival of guests**

The organising committee is responsible for the transport of participants from the international airport to the venue of the IChO. Any means of transportation may be used. Participating countries should supply a time schedule of the arrival of the delegations. Delegations should not be kept waiting too long at the airport.

Hotel accommodation must be available for delegations that arrive early or leave late. Those delegations meet the cost.

#### **Registration**

Before handing out the name tags and material, the identity of the team members should be checked against their passports

#### **Problems with travel documents**

The organising committee should check beforehand with the ministry involved the visa requirements for different countries. Generally an early discussion, i.e. 2 years before the event should lead to a number of sensible agreements between the ministry and the organisation. A contact person in the visa department is very handy in case of last minute problems. In Holland phone calls to a number of embassies worked very well in the two weeks prior to the event.

#### **Health requirements.**

Delegations must have a health insurance. This should be checked at registration.

Generally recommendations of the WHO should be followed when cases arrive as with the SARS crisis in Greece. A signed document by the head mentor, stating that all members of his team are insured should suffice.

#### **Academic code**

It is recommended that each delegation sign an academic code that includes a voluntary communication ban on students, mentors and observers during the critical part of the competition. Checking compliance should be at the discretion of the organisers.

In Groningen mobile phones for both the mentors and the students were collected. In Athens the organising committee collected the student's phones.

A welcome dinner is customary on this evening.

### **Day 2**

#### **Opening session.**

The opening session must be planned well beforehand, particularly if you want officials at the national government level to participate. They need to be asked at least a year before.

You must be aware of sensitivities among countries. China and Chinese Taipei/ Taiwan is the most famous example. It is wise to check your arrangement with the ministry of foreign affairs. They have a protocol department that can advise you.

During the opening session the teams are presented. In some Olympiads the students have carried their country's flag or had an image of the flag projected on the screen. In Bangkok photographs from each country were used.

Invitations should be sent to the embassies of the participating countries, and to whomever you think is important. Usually invitations are included in the handbag.

After the opening session a lunch can be served to the participants.

Students must be separated from the mentors after the opening session and until both exams have been sat. The groups have different programs as outlined below.

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## **The mentors program**

After the lunch following the opening ceremony, the mentors are taken to the laboratory where the practical examination will take place. They check that all equipment needed is present at each workspace, and that it is in good order. The positions in the laboratory are labeled with the code of the student that will work at that position. A plan indicating the place of each student must be available so that the mentors can find their students.

The head mentor then receives 2 copies of the exam. The mentors are transported to the venue where the jury session is to be held.

Jury meetings could be shortened considerably if there is adequate time for the delegations to study the problems and discuss them individually with the authors before the full jury meeting. Many of the issues that mentors may have with the tasks may be resolved in one-on-one discussion before the task is discussed in the entire international jury. During individual discussions and before the jury meeting, delegations should be informed of the changes the organiser would make based on the discussion. (E.g. a copy following the changes posted on a notice board during individual discussion, then a printed copy for the full jury meeting) This system is recommended for both the experimental and practical exam.

After the scientific committee has had a chance to discuss changes that were suggested by the mentors, Jury session 1 can begin.

Jury sessions can be very painful and lengthy. These are conducted in English and the command of English of many of the participants is not sufficient to effectively present, argue, debate the relevant points.

It is important to have a strong AND fair chairperson at these meetings. The most successful jury meetings in the past have been those where the chairperson allowed the various points to be discussed, insisted on firm written proposals for changes, presented these in a form which everybody could read and then called for a vote. Once the vote has been taken, the item was not further discussed. There may be merit in having a co-chair who is an experienced member of the Steering Committee or the Jury.

The Jury sessions are indeed exhausting, but they should not be limited and correctness of the competition tasks should be open for a discussion.

Correction of phrasing and English spelling should be done during individual discussion or the preparation of the text for English speaking students. Such mistakes only should be in Jury meeting if they can affect meaning.

During the jury session an overhead projector or a computer having the screen projected is the easiest way to discuss the different text proposals.

Microphones must be available for all speakers from the floor. The chair must insist that these be used.

Voting should be carried out carefully. Resolutions and options to be considered should be presented to the Jury very clearly (in writing if possible). Conformance with regulations (75% presence, majority vote) should be checked. Results should be announced to all delegations.

Once the final text is agreed upon, this document is made available through the computer network to the mentors of all of the participating countries. Final text, marking scheme (blue points) and red points should be introduced for acceptance.

The final versions of the exams have to be handed in by the head mentor. The computer network opens at the start of Jury session 1, closes at midnight. The next day, it reopens as soon as the mentors arrive.

### **Day 3**

This is the day set aside for translation. The host country should resist being persuaded to make changes additional to those decided upon in the jury session. Because a number of countries are finished fairly soon, it is possible to organise a small excursion.

### **Day 4**

This is a day of excursion for mentors and guests.

The mentors should arrive back around 16.00 PM, to receive the copies of the theoretical exam (2 per nation). It has worked well in the past to provide time for the mentors to study the exam for several hours and to meet with the authors individually. See above.

The text of the revised exam should be available to all. At 20.00 the second jury session should start. For the theoretical exams a split session has become the norm.

The computer room should be opened at the beginning of the jury session.

After the text of the final exam has been approved, it should be put on the network. Any changes afterwards should be avoided as much as possible.

### **Day 5**

The translation session usually starts around 09.00. Most countries will be finished by 17.00. This is a convenient day for the steering committee to meet.

### **Day 6**

The mentors are really free. They can be taken on an extensive excursion (Amsterdam in Holland, the boat trip in Greece) with the guests.

### **Day 7**

At breakfast the head mentor receives a copy of the answer sheets of the students. Even though they are required to mark the scripts, there is ample time for an excursion.

At night the third jury session takes place. The agenda for this so-called business meeting is prepared by the steering committee at their meeting. This meeting can be merged into the medal awarding fourth meeting.

### **Day 8**

The grading of the scientific committee and the mentors is compared during arbitration. It has worked well to have different sessions each involving 12 to 18 countries. The members of the scientific committee carry out the arbitration for their own question separately. There is a time limit put on the discussion for each. In difficult cases, the

delegation should be asked to return later. In cases where no agreement can be reached the chair of the scientific committee has the final word. If a delegation still disagrees, appeal to the jury is possible. This appeal will be decided upon before the allocation of the medals.

In the evening the fourth jury session is planned. The first item on the agenda is the allocation of the medals. This is done on the basis of a merit list presented in a form, which makes it impossible to correlate the numbers on the screen with individual student marks. The rest of the evening is used for the continuation of the business meeting.

## **Day 9**

The closing ceremony usually takes place in a special venue. See the remarks on the opening sessions.

The program of the closing ceremony has a number of set items.

- Discussion of the results by the chair of the scientific committee
- Awarding of the medals. The medal ceremony starts with the honorary mentions, the bronze, silver and gold medals. The best three are mentioned separately. The organising committee must be aware of the Regulations with respect to the number of the various types of medals that are awarded.
- Handing the IChO flag to the next organiser. This is done at the end of the ceremony. The representative of the next Olympiad is also allotted some speaking time.

In addition to the above there are usually some cultural items. The ceremony is followed usually with a party.

## **Day 10**

The delegations leave. Some teams go quite early (after the ceremony sometimes)

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## **The students program**

### **Day 2**

After the opening session the students are transported to their own hotel. Students need some time to prepare for the exams. Usually some getting-to-know-each-other activity is organised. A variety of excursions are desirable, some cultural, some scientific and some amusement park type things. Students also appreciate a bit of free time. Give them the schedule for public transportation and instruct them how to use telephones.

The laboratory safety instruction can take place at this point or be delayed until the next day.

### **Day 3**

Excursion

### **Day 4**

Practical exam

During the exams, English copies of the exams should be available for the students.

## **Day 5**

Excursion. Most students will also want to study for the theoretical exam.

## **Day 6**

Theoretical exam

During the exams, English copies of the exams should be available for the students.

## **Day 7**

Excursion. It is possible to combine this excursion with the mentor's excursion.

## **Day 8**

Excursion.

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## **The guests program**

The guests go along with the program of the mentors when there are excursions. Otherwise special excursions are organised for them.

