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## IPT Game Rules

Note: The IPT Game Rules can be changed by the IPT Decision Assembly or by the GM and they are overruled by the IPT Rules. The IAPS Events Manager needs to be informed at least 8 weeks before the start of the event about any document changes. After consultation with the IO, the EC can call a GM if any IPT Game Rules changes are deemed unnecessary or contrary to IAPS' interests or values.

### 1. List of problems forming

- 1.1. Each edition of the IPT is composed of 17 problems selected by the DA, proposed by the community, and edited by IO. Anyone can suggest problems for the IPT.
- 1.2. The final problem list is publicly announced at least 8 months before the next edition.
- 1.3. The IPT Secretary is in charge of collecting problems at any time during the year. The deadline for submitting problems for a given edition is 2 weeks after the end of the previous edition.
- 1.4. A special committee formed by the IPT Secretary is in charge of building a shortlist of a maximum of 80 problems, to be ready two weeks after the deadline submission. The problems are selected following a weighting of four criteria:
  - (a) Problem originality;
  - (b) How challenging is the problem;
  - (c) Does the problem formulation allow a theoretical and experimental solution (although occasionally, purely theoretical or experimental problems can be accepted)
  - (d) Does the problem solving comply with basic safety regulations and is it reasonably easy and/or cheap to perform experiments on it
- 1.5. The problems can be adapted from their original formulation to better fulfill the previous criteria. Once ready, the shortlist is sent by default to national representatives, as well as specific institutions upon written and motivated request.
- 1.6. The person receiving the problems is responsible for distributing them to all people involved in their country, gathering scores for the problems, and reporting them back to the IPT Secretary. Each country with an IPT Representative can split 100 points between the problems. Countries without an IPT Representative and specific institutions can split 50 points between the problems. The votes are weighted based on how many people from each country contribute.
- 1.7. The IPT Secretary sums up the scores from all countries and formulates the final list of 17 problems out of those with the highest score. The IO reserves the right to include the problems limiting themselves to the top part of the voting list to guarantee:
  - (a) the safety of the participants when performing experiments;
  - (b) the availability of the equipment for the potential participants;
  - (c) reasonable coverage of different fields of physics;
  - (d) the originality of the problems considering possible new referenced work or relevant comments.

## 2. National Selections

- 2.1. Teams from countries with IPT Representatives submit their applications directly to them. The IPT Representative is responsible for the equal judgment of all applying teams from their country and is encouraged to organize a national preliminary. Any problem with an IPT Representative should be reported to the IO President as soon as possible.
- 2.2. Registrations from teams without an IPT Representative are submitted to the IO, prior to any international preselection process, but following the same criteria used for the preselection process. Only the best report from each country will be considered for the international preselection process.
- 2.3. Only one team per country can register. An exception is made for the extra LOC team if the number of applying countries is less than the available seats.
- 2.4. The IO recognizes the result of a national selection under the following conditions:
  - (a) there is no discrimination of any sort regarding the participants nor the teams as a whole;
  - (b) the national selection gathers at least two teams of a minimum of three students each and features at least two Physics Fights, each composed of at least one Presentation and one Opposition. The PFs timing can be freely adapted from the stage regulation;
  - (c) each participating team has the option to participate in the national selection for free. The team can however be charged for catering, housing, and transport services but this should remain optional;
  - (d) the winning team is fully eligible to arrange the participation in the IPT with or without the help of their respective IPT Representative and is not responsible for any expenses except for those needed to participate by themselves.
- 2.5. In case of any issues with the national selection ignored or misconducted by the organizational team, the IO and especially the IO President are in charge of resolving it.

## 3. International stage participants' determination and preselection

- 3.1. If more teams are registered teams than seats available, the IO runs an additional preselection round
- 3.2. The host country can register one additional team, the choice of which is left to the LOC, which is qualified by default.
- 3.3. When more than the maximum number of teams apply, the teams representing the countries that were ranked in the top 7 positions of the previous edition are automatically qualified, as well as the optional extra LOC team.
- 3.4. All other teams, whether selected through a national selection or applying directly, must complete a written report outlining the solution to one of the problems from a subset of the official list, named "preselection list", which is selected by the IO and announced when the registration opens. The problems in the preselection list can be reported by any team.
- 3.5. Teams that participated in national selections will have two further problems.
- 3.6. The teams have 4 weeks after the registration deadline to send their written report. The report must have a .pdf format and cannot exceed 5 pages (except the title page). The team is allowed to enclose its own experimental material (videos, photos, computer programs - smaller than 10 Mb in total) and to cite it properly in the report. All submitted material shall not hold any hints about the team name or affiliation.
- 3.7. Upon submission, the IPT President will anonymize submissions for further grading by a pre-selection grading panel.
- 3.8. Each report will be judged on the basis of three main criteria:

- (a) it gives a plausible physical answer to the initial question;
- (b) it has an innovative approach, supported by experiment and/or theory;
- (c) the problem has been explored in sufficient depth, i.e. all the possible approaches have been considered. The form of the report (layout, phrasing, presentation) is also important. It should be written in a clear and concise manner.

- 3.9.. The list of participating teams will be announced no more than two weeks after the report submission deadline.
- 3.10. If the number of countries with teams registered for the tournament is lower than the number of available seats, runner-ups of national selections will be invited to fill the remaining seats.
- 3.11.. The additional team inclusion precedence is decided by IPT President in coordination with LOC and IO considering all the factors including the last year's performance, this year's performance on national selection, and the ability of the team to find the funds at the moment, etc. The decision should be fair and transparent. A third team from the host country can be invited following the rules above only if all the runner-ups declined the invitation.

#### 4. Procedural rules

- 4.1. The LOC is responsible for the even distribution of teams across the fights and groups to minimize repetitions. Making groups of three to four teams PFs depending on the number of teams and juror's availability.
- 4.2. Team leaders, at least one from each team, may be included in the jury providing the team has a team leader eligible for judging. Multiple jury members from the same country must be distributed uniformly across the fights. Team leaders must not be members of the juries judging their own country's team.
- 4.3. Jury
  - 4.3.1. The jury is nominated and organized by the LOC in cooperation with the IO.
  - 4.3.2. The panel consists of at least five members per PF, preferably balancing the countries' diversity.
  - 4.3.3. The LOC, in cooperation with the IO, can decide at its own discretion to use or not the team leaders as jury members for any PF.
- 4.4. The PF regulations
  - 4.4.1. Depending on the total number of teams, a PF involves preferably three or, optionally, four teams.
  - 4.4.2. In the course of a PF, team members are only allowed to communicate with participants of the same PF. Before the beginning of a PF, the jury and the teams are introduced.
  - 4.4.3. The PF consists of three (or four) Rounds. In each Round, a team plays one of the three (four) roles: Reporter, Opponent, Reviewer (Observer). In the subsequent rounds of the PF, the teams change their roles according to the following schemes:

Three teams PF				Four teams PF				
Team/Round	1	2	3	Team/Round	1	2	3	4
A	Rep	Rev	Opp	A	Rep	Obs	Rev	Opp
B	Opp	Rep	Rev	B	Opp	Rep	Obs	Rev
C	Rev	Opp	Rep	C	Rev	Opp	Rep	Obs
				D	Obs	Rev	Opp	Rep

- 4.4.4. Team captains may choose any available position in the PF (i.e. A, B, C, or D). The order in which the captains choose their positions is determined at the beginning of each PF via the captains' fight.
- 4.4.5. The fight's winner chooses whether he wants to be the first, second or third (or fourth) to write down his team's position. The captain that arrived second in the fight chooses and finally, the teams' positions are decided. The problems for the captains' fights are prepared by the LOC. The

captain fights consist of a challenging little task or test in physics/math, and cannot exceed 3 minutes, except during the final where they can be extended to 30 minutes and multiple problems to solve.

#### 4.5. The stage regulations

4.5.1. The PF is ruled by a chairperson, selected by the LOC. Each Stage schedule is regulated by the chair according to the following table:

The performance order in the Stage of a PF	Reserved time in minutes (in Grand Finale)
1. The Opponent challenges the Reporter to present a problem	1
2. The Reporter accepts or rejects the challenge	1
3. Preparation of the Reporter	5
4. Presentation of the report	10 (12)
5. Clarifying questions from the Opponent to the Reporter and answers of the Reporter	2
6. Preparation of the Opponent	3
7. The Opponent's speech	5
8. Discussion between the Reporter and the Opponent	5
9. Clarifying questions from the Reviewer to the Reporter and the Opponent and their answers	2
10. Preparation of the Reviewer	1
11. The Reviewer's speech	3
12. Discussion between the Reviewer, the Reporter and the Opponent	4
13. General discussion between the teams	5
14. Concluding remarks by the Reporter	1
15. Questions from the Jury	6
16. Jury decides their marks	1
17. Jury remarks/comments	4
<b>Total Time for a PF</b>	<b>59</b>

4.5.2. Each team participating in a PF has the right to use one time-out during the whole PF (consisting of three or four rounds). The time-out lasts for one minute and during the time-out, every participant of the round can consult with their team. The time-out cannot be taken during any team's presentation.

4.5.3. The chair of the fight is responsible for the introduction of the teams and jurors, the captain's fight, timing, and fair play in general.

#### 4.6. Team's performance in rounds

4.6.1. The Reporter presents the essence of the solution to the problem, attracting the attention of the audience to the main physical ideas and conclusions. It is strongly recommended that the Reporter presents some original ideas and compares his own theoretical results with those obtained by self-made experiments, when possible.

4.6.2. The Opponent puts questions to the Reporter and criticizes the report, pointing to qualities and/or possible inaccuracies and errors in the understanding of the problem and in the solution. The Opponent analyses the advantages and drawbacks of both the solution and the presentation of the Reporter. The discussion between the Opponent and the Reporter should focus on how to correct or improve the Reporter's solution. Some experimental results obtained by the Opponent that clearly exhibit the inconsistencies of the Reporter's model and/or short calculations that show the errors or

inapplicability of the Reporter's theory can be presented in a very brief way. The Jury should decide on the relevance of such elements for the discussion. At the end of the discussion, the participants should agree on what can be changed/improved on the Reporter solution.

- 4.6.3. The Reviewer presents a short summary of the presentation of the Reporter and Opponent. The Reviewer's presentation should mention in particular if the discussion between the Reporter and Opponent has been fruitful or not, and why. The Reviewer can mention which aspects of the problem could have been addressed, but cannot mention his own results on the problem. The main goal of the Reviewer is to summarise the work done by the Reporter and the Opponent from a jury member's point of view, in order to help the jury decide their marks. In the following discussion between all the participants, the Reviewer will moderate the discussion between the Reporter and Opponent, helping them to focus on the most important physical points of the problem.
  - 4.6.4. The Observer does not participate in the round.
  - 4.6.5. During a PF, only one team member takes the floor as an Opponent or a Reviewer, but there can be up to two Reporters during the Reporter's presentation. Other members of the teams are allowed to help with the presentations technically. There are no limitations on communication between team members during the preparation time. The team members are allowed to give their players brief remarks in written form at any time, except for the Reporter's, Opponent's, and Reviewer's presentations.
  - 4.6.6. No member of a team is allowed to take the floor more than twice during a PF. Furthermore, during the Final PF, any team member can take the floor only once.
- 4.7. The rules of the problem challenges and rejections
    - 4.7.1. All problems presented during a PF must be different.
    - 4.7.2. The Opponent may challenge the Reporter on any problem with the exception of a problem that:
      - a) was permanently rejected by the Reporter earlier;
      - b) was presented by the Reporter earlier;
      - c) was opposed by the Opponent earlier;
      - d) was presented by the Opponent earlier.If there are no problems left to challenge, the bans d), c), b), and a) are successively removed, in that order.
    - 4.7.3. The Reporter may tactically reject the challenge of three different problems in each PF without penalty. In addition to this, each team has one free permanent rejection which may be used at any moment, and without penalty.
    - 4.7.4. During the first PF, teams can use one extra tactical rejection without incurring any penalty.
    - 4.7.5. Every rejection in addition to those defined above is considered a permanent rejection and induces a penalty. For each incurred penalty the coefficient of the Reporter is decreased by 0.2.
    - 4.7.6. This reduction continues to apply during the following PFs.
    - 4.7.7. Permanent rejections, once made, apply to current and all future PFs.
  - 4.8. The grading
    - 4.8.1. After each stage the jury grades the teams, taking into account the presentations, questions, answers to the questions, and participation in the discussion.
    - 4.8.2. Each jury member shows integer marks from 1 to 10. If there are five or six jury members the lowest mark is discarded, if there are seven or eight jury members one lowest and one highest mark is discarded. For larger jury numbers, the number of discarded marks is a quarter of the jury members, rounded up (if this number is odd, one more of the lowest marks is discarded than the

highest).

4.8.3. This sum is used to calculate the mean mark for the team. The mean marks are multiplied by different coefficients: 3.0 for the Reporter, 2.0 for the Opponent, 1.0 for the Reviewer, and then transformed into points.

#### 4.9. Extra points and the total sum of points

4.9.1. For a team in a PF the Sum of Points (SP) is the sum of mean marks, multiplied by the corresponding coefficients and rounded to one hundredth. Additionally, the team which won the PF receives 2 additional points and the team which arrived second receives 1 extra point. In the case of ex aequo, 3 points are divided between all teams that won first place in the PF.

4.9.2. The Total Sum of Points (TSP) of a team is equal to the sum of SPs in all PFs. The number of Fights Won (FW) is the number of PFs, in which a team received the highest SP among the three or four teams participating in the same PF.

#### 4.10. The semifinals

4.10.1. The semifinal's inclusion in the IPT is decided by the LOC. However, the semifinals are strongly recommended to be organized if the number of teams is more than 14.

4.10.2. At the end of the selective PFs, the team with the highest TSP is automatically qualified for the final, whereas teams from positions 2 to 7 will take part in the semifinals. In the case of ex aequo, the team with the higher number of FW will be favored.

4.10.3. The semifinals consist of two PFs carried out simultaneously, one held between teams whose positions in the rankings at the end of the selective PFs were 2nd, 5th, and 6th, and the other one between teams in position 3rd, 4th, and 7th.

4.10.4. All challenge limitations, rejections and penalties from the selective PFs still apply during the semifinals.

4.10.5. The TSP and the FW obtained during the semifinals add up to the TSP and the FW obtained during selective PFs.

4.10.6. During semifinals the bonus points assigned (see rule 2.4.1) are doubled.

#### 4.11. The final

4.11.1. Three teams are qualified for the finals. Depending on the semifinal's inclusion, the order is:

(a) The team(s) qualified by default after the Selective PFs (if applicable).

(b) The team(s) with the highest TSP. In the case of ex aequo, the team with the higher number of FW will be favored.

4.11.2. The teams participating in the final choose the problems they will report themselves and proclaim them at a meeting of all the finalists. The teams choose the problems in order of being qualified for the final.

4.11.3. No team can choose a problem already chosen by another team.

4.11.4. The podium order is decided by the points awarded during the final only.

### 5. Alternative presentations sessions

5.1. After deciding the problems for the final, and before the final, the LOC may opt to organize one or two alternative presentation sessions, also known as the IPT Conference. The LOC determines the place, time, and format of these events. The teams are invited to present their solutions to the problems they haven't presented yet.

5.2. These sessions are facultative, and have no impact on the final ranking. If the schedule is limited the time

slots are distributed uniformly among the teams giving the priority to non-semifinalists, then semifinalists, and, ultimately, finalists.

5.3. Problems to be presented in the Final cannot be reported during the alternative presentations session.

## 6. Research ethics requirements and Penalties

- 6.1. When working on the problems, participants and individual national representatives must abide by the laws and regulations of their country and university. The DA and IO as a whole cannot be held responsible for any damage caused when working on the experiments.
- 6.2. During the competition, the participant(s) performing an experiment will not hold the organizers responsible for any damage or injury which may result thereof.
- 6.3. During the solving problems, presenting, and discussions, participants should follow ethical norms of running research, performing experiments, citing, and claiming ownership.
- 6.4. The participants can ask the LOC at the latest three weeks in advance for supplementary safety material (wooden box, safety walls, or other equipment) to be used during the tournament. Providing or not this material is at the discretion of the LOC.
- 6.5. The chair can forbid the participants to perform an experiment live if they think the safety of the public and/or of the jury is compromised. Prior to the tournament, the participants can ask the LOC if they are unsure about the possibility to perform an experiment.
- 6.6. All the equations, their derivations as well as simulation and experimental results must be documented properly, with clear links to all the sources used.
- 6.7. The participant's original work and results must be documented either in the main part of the presentation or on additional slides that must be presented upon request. The documentation must be detailed enough to establish the authorship of the work:
  - (a) For a theoretical result, it is advised to have all the calculations leading to this result on additional slides.
  - (b) For numerical simulations, it is advised to prepare the program source as well as some tables or plots from its output.
  - (c) For the experimental work, it is requested to have a photo/video of the experimental setup in the main part of the presentation.
- 6.8. Questions can be asked during or after the fights by the jury members about a specific part of the setup or certain data points; it is thus advised to have enough supplementary material to answer any questions related to the steps of the experimental process.
- 6.9. The opposing and the reviewing teams are allowed to request the documentation listed above and to point out to the jury the acts of plagiarism if they are discovered. The jury members take into account the penalties listed below when grading the presentation. In case of serious fouls, additional punishment measures are applied.
- 6.10. If an act of plagiarism is discovered after the PF, the jury reserves a right to apply punishment measures in the period between the selective PF and the final, if the foul happened during the selective PF, or within one year after the final, in which the act of plagiarism occurred.
- 6.11. Actions and behavior that may be considered cheating or plagiarism trigger punishment measures upon the offending team. The possible measures are:
  - 6.11.1. Minor punishments are applied in case of light fouls. This implies actions that may lead the jury members to believe that the results are produced by the presenter team, while they are:
    - not stating the source of the general-knowledge formula used for the further derivations results in a warning.
    - using the qualitative explanation of the phenomenon without citing the source results in a

warning.

- not citing the source of equation derivation results in a warning.

6.11.2. If more than two warnings are given in a single physics fight, the punishment can result in one or many of the punishments listed below.

- using a graph, figure, or video published previously without citing the source - up to 3 points penalty.

- not citing the source of the theoretical models - up to 5 points penalty.

- not citing the source of the computer simulations results - up to 5 points penalty.

- not citing the source of the experimental results - up to 5 points penalty.

6.11.3. These points are given in terms of the total score of a team in the PF. In case the foul is revealed by the opponent or the reviewer teams, each jury member applies approximately the corresponding penalty divided by 3 when grading the presentation.

6.11.4. Severe penalties are applied to conscious violations of rules. This includes a team claiming to have produced their presented results, which appear to have been previously published and claim to be their own work. The penalties that may apply are:

- a figure, a graph, or a video - up to 5 points penalty.

- the theoretical model - up to 8 points penalty.

- the computer simulations results - up to 8 points penalty.

- the experimental results - up to 8 points penalty.

- a large part of the presentation if the reporter nevertheless shows a good knowledge of the presented work - up to 10 points penalty.

- entire presentation, not understanding the elements of the copied presentation, or other severe cases of crude research ethics violation - up to total team disqualification and annulment of the PF results.

6.11.5. The severity of a case is decided by the jury members as soon as possible. Light foul measures are decided by jury members of the corresponding fight. In case of severe rules violation, the penalty is decided by a council formed by the IPT President and a senior Jury delegate in attendance of the offending team and team leaders during some parts of the hearing. The offending team may appeal against light foul penalties to a council decision. The jury council's decision is irrevocable.

6.11.6. A penalty of 2-10 points is applied in the case of:

- data falsification or fabrication,

- lack of documentation proving that the experiment took place.

The severity of each case is decided by the jury members of the PF analogously to the cases of plagiarism.

6.12. Unethical, sarcastic, discriminatory, and other disrespectful behavior leads to penalties ranging from a warning to disqualification of the team.