

The Young Physicists' Tournament is a competition among teams of high school students in their ability to solve complicated scientific problems, to present solutions to these problems in a convincing form and to defend them in scientific discussions - "Physics fights".

The Tournament has a long tradition which began in 1979 in the Physics department of Moscow University. It has become a wide-spread form of work with high school students. The aim of the Tournament is to attract bright students in order to test their analytical and investigative abilities and to provide an environment which encourages their creative development. Now the Tournament is international and includes teams from Bulgaria, the Czech Republic, Slovakia, Germany, Great Britain, Holland, Hungary, France, Italy, Poland and the former republics of the USSR.

### THE WINNERS OF THE INTERNATIONAL YPT

Number	PLace	Date	1st prize	2nd prize
I	Moscow, Olimpiets	April 1988	Poland USSR	Hungary
II	Moscow, Olimpiets	April 1989	Bulgaria Germany	USSR
III	Moscow, Olimpiets	April 1990	USSR (MPEI)	Holland USSR (Riga)
IV	Moscow, Olimpiets	August 1991	Hungary	USSR
V	Moscow, Protvino	June 1992	Belorussia Czechoslovakia	Holland Russia
VI	Moscow, Protvino	June 1993	Georgia	Ukraine Hungary

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## THE TOURNAMENT FEATURES

### 1. THE COLLECTIVE NATURE OF THE WORK.

The YPT is distinct from Physics Olympiads in its incorporation of collectives - school teams. The creative work of each member of the team, in accordance with his or her interests and possibilities, helps to obtain substantial results. The YPT participants gain experience in joint scientific investigations.

### 2. THE YPT PROBLEMS.

The YPT problems always have many levels, resembling real scientific problems. To solve these problems students have to perform, by themselves, experimental and theoretical investigations. The text of a YPT problem is short, without comments or indications of what is important and what is negligible. Students should make approximations and simplifications, choose a proper theoretical model, find an algorithm of solution, investigate the obtained results, and so forth. In other words, they should pass through all the stages of real scientific work.

### 3. SCIENTIFIC DISCUSSIONS - PHYSICS FIGHTS

The participants present their solutions in the course of scientific discussion - Physics Fight (PF). Every team in turn takes part in the PF as a Reporter, an Opponent and Reviewer. In the PF, students should defend their solutions. This demands profound knowledge of the subject and also an ability to quickly find relevant arguments and to see weak points in the solution of the rivals. Such discussions give students a unique possibility to understand the ethics and rules of scientific communication.

### 4. THE LONG-TERM RESEARCH

YPT is not just a series of competitions. During the stage of work on the problems, a research group develops at the schools, whose members may considerably outnumber the team participating in the PF. This group does not terminate its activity even after the final round. The solution of the YPT problem often becomes the theme of a report at a students' scientific conference, a paper in a journal, etc.



# RULES AND REGULATIONS OF THE YPT

- I. The regulations of the International Young Physicists' Tournament are established by the International Organizing Committee (IOC YPT).

## II. THE PROBLEMS OF THE YPT

The problems are formulated by the Organizing Committee and sent to the participants of the YPT in October. These problems may be used for the regional and national Tournaments.

For composing the problems the meeting of the IOC YPT may be held in the host country.

## III. THE PARTICIPANTS OF THE YPT

### 1. The national teams

Any invited country may present one team. The host country may present two teams. These teams participate in the "Tournament of Countries".

### 2. The teams of regions, towns, clubs, colleges

The decision about participation of such a team may be taken by the Organizing Committee of the host country. These countries participate in the "Tournament of Teams".

The tournaments of countries and teams are carried out within the framework of the same YPT. The team representing a country simultaneously participates in the "Tournament of Countries" and in the "Tournament of Teams".

### 3. The membership of the teams

The YPT team is composed of five high school students. The high school graduates participate in the YPT in the year of their graduation. The participation of university students is not allowed. The Organizing Committee may allow participation of teams of four or three students. The composition of the team is not changed during the Tournament.

The team is headed by the captain who is an official representative of the team during the PF.

4. The team is accompanied by the two team leaders.

## IV. THE MEMBERSHIP OF THE JURY

The Jury is formed by the IOC YPT. It consists of independent members and representatives of the participating countries. Prominent scientists and professors are drawn in the Jury. For independent members of the Jury not familiar with the YPT problems a lecture is organized outlining the main ideas and methods to be used in the solutions.

The team leaders (one from each team) are included in the Jury.

## V. THE AGENDA OF THE YPT

The International YPT is carried out in time determined by the IOC YPT (in June - July or in April) during ten days.

The teams participate in scientific discussions - Physics Fights:  
a) 3 selective PF; b) semi-finals; c) finals.

After the finals the solutions of the problems are presented at a special meeting by the best Reporters and the authors of the problems. The host country provides a cultural program for the participants.

## VI. THE PHYSICS FIGHT REGULATIONS

Three or four teams participate in a PF (depending on the total number of teams). In the course of a fight the members of a team communicate only with each other.

Before the beginning of a PF, the introduction of the Jury and the teams takes place.

The fight is carried out in three (or four) stages. In each stage, a team plays one of the three (four) roles: the Reporter, the Opponent, the Reviewer (the Observer). In the following stages of the PF, the teams change their roles according to the role scheme:

Three teams PF

Team	Action		
	1	2	3
1	Rep	Rev	Opp
2	Opp	Rep	Rev
3	Rev	Opp	Rep

Four teams PF

Team	Action			
	1	2	3	4
1	Rep		Rev	Opp
2	Opp	Rep		Rev
3	Rev	Opp	Rep	
4		Rev	Opp	Rep

## VII. THE STAGE REGULATIONS

The order of performance in the stage:

1. The Opponent challenges the Reporter for the problem
2. The Reporter accepts or rejects the challenge
3. Preparation for the presentation..... 5 min
4. Presentation of the report..... 8 min
5. Questions of the Opponent to the Reporter and answers of the Reporter..... 2 min
6. The Opponent takes the floor..... 4 min
7. Discussion between the Reporter and the Opponent..... 5 min
8. Questions of the Reviewer to the Reporter and the Opponent and answers to the questions..... 2 min
9. The Reviewer takes the floor..... 2 min
10. Concluding remarks of the Reporter..... 2 min
11. Questions of the Jury
12. Grading by the Jury
13. The Jury takes the floor..... 5 min
14. Additional remarks (if necessary)



The official languages of the International YPT are English and Russian. In case a translation is necessary the time of presentation is doubled.

#### VIII. THE PERFORMANCE OF TEAMS IN THE STAGE

The Reporter (one or several members of the team) presents the essence of the solution to the problem, attracting the attention of the audience to the main physical ideas and conclusions. It is desirable to show the pictures, diagrams, slides, photos prepared in advance, and to demonstrate some experiments if the problem is an experimental one.

The Opponent (one or several members of the team) puts questions to the Reporter and criticizes the report, pointing to the inaccuracy and errors in the understanding of the problem and in the solution. The Opponent analyzes the advantages and drawbacks of both the solution and the presentation of the Reporter. The discussion of the Opponent should not become the presentation of his own solution.

In the polemics, the solution presented by the Reporter is discussed.

The Reviewer (one or several members of the team) presents a short estimation of the presentations of the Reporter and the Opponent.

Limitation on the number of presentations: during one PF no member of the team may take the floor more than twice (brief remarks are not taken into account).

#### IX. THE RULES OF CHALLENGE TO THE PROBLEM AND OF THE REJECTION IN THE SELECTIVE PHYSICS FIGHTS AND SEMI-FINALS

In these PF are used all the problems not excluded by the Organizing Committee.

The Opponent may challenge the Reporter on any problem with the exception of a problem that

- a) was presented by the Reporter earlier;
- b) was opposed by the Opponent earlier;
- c) was presented by the Opponent earlier.

If such a challenge cannot be made, the bans c), b), a) are successively removed in the given order. During all selective fights and semi-finals the Reporter may reject the challenge four times in total without penalty. For every subsequent rejection the coefficient of the Reporter (see item X) is diminished by 0.2.

All the problems rejected by the reporter are included in the rejection list of the team. The rejection of these problems in the successive PF does not involve penalty.

The rejection of the problems unified by the Organizing Committee into one block does not involve penalty if the problem of the same block is already in the Rejection List of the team.

## X. THE GRADING

After each stage, the Jury rates the teams, taking into account all presentations of the members of the team, questions and answers to the questions, and participation in the discussion. The marks are transformed into grades and then into points with various coefficients for the Reporter, Opponent and Reviewer according to the scheme:

Mark	5+	5	5-	4+	4	4-	3+	3	3-
Grade	53	50	47	43	40	37	33	30	27

	Reporter	Opponent	Reviewer
Coefficient	3.0 or less	2.0	1.0

The coefficient of the Opponent challenging for problem #1 ("Think up a problem yourself") is 2.2, since he takes the risk to face the unknown problem.

If the Jury consists of 5 or 6 persons, then in the evaluation of the mean grade the lowest grade is withdrawn. If the Jury consists of more than 6 persons, then the highest and the lowest grades are withdrawn.

Independent members of the Jury are distributed among the groups of teams by the Organizing Committee. The team leaders cannot be the members of the Jury in the groups where their teams participate.

## XI. THE RESULTING PARAMETERS OF THE PHYSICS FIGHT

SP is the sum of mean grades multiplied by the corresponding coefficients and rounded to 1. SP1 - SP4 are the SP parameters of the teams having obtained places 1 to 4.

R is rating which characterizes the success of team in the PF. R1 - R4 are the ratings of the teams having obtained places 1 to 4.

SP	Place of team in the fight		
	1	2	3 Or 4
> 290	5	4	3
> 240	4	3	2
> 190	3	2	1
< 190	2	1	0

If  $SP1 - SP2 < 6$  then  
R2 is increased by 0.5

If  $SP2 - SP3,4 < 6$  then  
R3,4 is increased by 0.5



## XII. SELECTIVE PHYSICS FIGHTS

Numbers of teams in the schemes are determined by lot.

In the course of the selective fights any team meets with another team only once. The distribution of the team leaders among the groups assures that they do not judge their own team. The schemes for the selective PF and semi-finals, with more than 20 or less than 15 teams, should be composed using these principles.

### 1st selective fight

#### 18 - 20 TEAM FIGHT

Group	I	II	III	IV	V	VI
Reporter	1	2	3	4	5	6
Opponent	7	8	9	10	11	12
Reviewer	13	14	15	16	17	18
	19	20				

#### 15 - 17 TEAM FIGHT

I	II	III	IV	V
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17			

### 2nd selective fight

Group	I	II	III	IV	V	VI
Reporter	11	12	7	8	19	20
Opponent	16	17	18	13	9	10
Reviewer	6	1	2	3	14	15
				4	5	

I	II	III	IV	V
17	10	6	7	16
9	14	15	11	8
13	1	2	3	12
5				4

### 3rd selective fight

Group	I	II	III	IV	V	VI
Reporter	18	13	14	15	16	17
Opponent	5	6	1	19	20	4
Reviewer	9	10	11	2	3	8
				12	7	

I	II	III	IV	V
15	11	12	13	14
4	5	1	16	17
7	8	9	2	3
			10	6

Distribution of the team leaders among the groups in the selective physics fights

Group	I	II	III	IV	V	VI
Team leaders	2	3	4	5	6	1
	8	9	10	11	12	7
	14	15	16	17	18	13
	20					19

I	II	III	IV	V
2	3	4	5	1
8	9	10	6	7
12	13	14	15	11
		16	17	

### XIII. THE SEMI-FINALS

Nine teams having the highest rating (in case of equality - the highest SP) in the selective fights participate in the semi-finals. Teams in the schemes are enumerated according to their rating.

Distribution of teams and team leaders among the groups

Group	I	II	III
Reporter	1	2	3
Opponent	6	5	4
Reviewer	7	8	9

Group	I	II	III
Team	2	3	1
	5	4	6
	8	9	7

The rules of challenge for the problem and of the rejection are given by item IX.

### XIV. THE FINALS

Three teams, the winners of the semi-finals, participate in the finals. The finals begin with the introduction of the teams, which is a small theatrical performance of arbitrary style three minutes long, in which the team leaders and fans take part. Then comes the competition of captains, the regulations for which are established by the Organizing Committee. These two performances are graded by the Jury.

The order of presentation in the finals is determined by the winner of the introduction and the competition of captains.

In the finals, 6 problems are used, which are determined by the Organizing Committee according to the rating lists prepared by the participants of the finals in the following way:

Number of the problem	Integer number in the range 1 - 100
.....	.....

The sum of numbers in the second column should equal 100.

The Opponent may challenge the Reporter for any of the 6 problems. The Reporter may reject the challenge twice without penalty. For any subsequent rejection the coefficient of the Reporter diminishes by 0.2.

### XV. THE WINNERS OF THE TOURNAMENT

#### 1. The team competition.

The place in the Tournament is determined by the value of R (in case of equality, by the value of SP). The teams are undistinguishable if the values of R are equal and the values of SP differ by less than 6.

The participants of the semi-finals assure for themselves place III. The participants of the finals assure for themselves place II and compete for place I.

#### 2. The individual competition.

The speech of the member of a team in the role of the Reporter, the Opponent or the Reviewer is considered successful if all the grades for it taken into account are higher than 3+. In the successful speeches the member of the team gathers points:

Grade	5+	5	5-
Points	3	2	1

The individual winner of the Tournament is determined by the value of the individual rating (IR) which equals the sum of points gathered in all successful speeches, divided by the number of the grades taken into account.