

Thirty-Sixth Annual-ish PHYSICS OLYMPICS



**Friday, March 18, 2022
8:30 AM - 1:00 PM
Smithtown High School East**

Sponsored by:
Long Island Physics Teachers Association
Hosted by:
Smithtown Central School District

Registration for 2022 Physics Olympics

Register:

- Go online to www.lipta.org to register your 5-student team.
- A maximum of 5 students may attend (no spectators).
- Signed photo release forms (enclosed) are required for all participants and their advisor, and will be collected at the event.

Confirmation:

- You will receive a confirmation email after you successfully register.
- Check www.lipta.org to make sure that you are on the official list of participants *before the event*.

Registration deadline: March 11 (you must be registered to participate - check online to make sure you are officially registered). Maximum 18 teams, so register early!

By March 11 please go to www.lipta.org to enter the names of expected participants.

Fee for the Physics Olympics:

Members	\$100*
Non-members	\$115* (includes one year membership)
	*includes 2 pizzas and soda

Send a check or PO to our address: **LIPTA**
419 Renee Drive
Bayport, NY 11705

Or pay on-line by credit card or Paypal at www.lipta.org
Need an invoice? Email us a request at treasurer@lipta.org

Physics Olympics schedule:

Date: **Friday, March 18, 2022**

Place: **Smithtown High School East, 10 School Street, Saint James, NY 11780**

NOTE: Enter through "Visitor's Entrance"

Registration: 8:30 am

Event Start time: 9:00 am

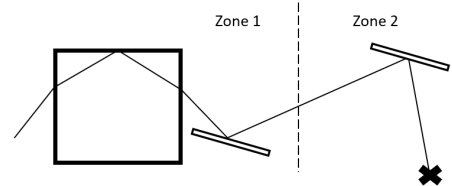
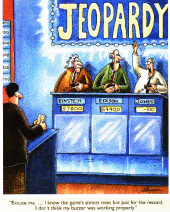
Awards: 12:45 pm

Text Justin King at 631-241-5404 or email king@lipta.org for more information.

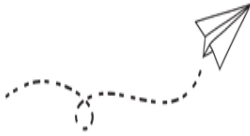
The Rules

The events for the 2022 Physics Olympics are:

The Physics Bowl Fermi Questions Laser Light Show



Aerial Accuracy



Slow Roller



1. Each school may send a single team of no more than 5 students. Sorry, no more students or spectators can be accommodated. Violation of this rule will result in disqualification of the team.
2. All participants and advisors must bring a signed photo release form, copy enclosed.
3. Each team must have a faculty member. High school faculty will judge the events. At least two judges will judge each event. Judges will not evaluate their own school's team.
4. Each event is timed. Teams late for an event will forfeit that event. Wear a watch!!
5. Teams should bring scientific or graphing calculators for the Physics Bowl, and are encouraged to wear team T-shirts. Equipment, including calculators, for other events are limited to what is provided by the judges at each event.
6. Accessing the internet is prohibited during competition.
7. For each event, the total number of points for 1st place will equal the number of teams present. For example, if there are 16 teams competing:

1st place = 16 pts

2nd place = 15 pts

3rd place = 14 pts

The last team will score 1 pt. Tying teams will split points equally for the places in question.

8. If two teams tie in overall points, their placement in the Physics Bowl will be the tiebreaker for overall standing.
9. Trophies will be awarded to the top three teams in each event and to the four teams which accumulate the most points overall.
10. A certificate will be awarded to the team with the best physics T-shirts, as determined by the judging panel of experts. The T-shirt award will **not** count towards the overall trophy.
11. All judges' decisions regarding events are final. The wording of each challenge in this year's event book has been carefully prepared to define each task as precisely as possible. It is expected that all participants will produce solutions which comply with the task as defined. Normal physical interpretations will be applied to all the terminology used in defining the tasks. Those solutions which, in the opinion of the judges, do not comply with the spirit or intent of the event will be disqualified. General questions regarding the events may be directed to the coordinators of the Olympics. The coordinators will accept inquiries which may help them to prepare for unusually good solutions to the problem.
12. Students are required to remain with their team and in the designated areas at all times.
13. Any concerns regarding inappropriate behavior and/or conduct, including any form of harassment, must be brought to the attention of a LIPTA exec board member. Members will be present at the Physics Olympics or may be contacted at exec@LIPTA.org.
14. Text or email Justin King at 631-241-5404 or king@lipta.org if you have any questions.

The Schedule

1. Events begin at 9:00 AM.
2. Park in the south parking lot and enter through the entrance marked "Visitor's Entrance". (Refer to map) Look for LIPTA signage.
3. Teams may pick up their materials between 8:30 AM and 9:00 AM.
4. Team registration includes lunch (2 pizzas + soda).
5. Morning refreshments and lunch will be provided to faculty and students.
6. Trophies will be awarded at 12:45.

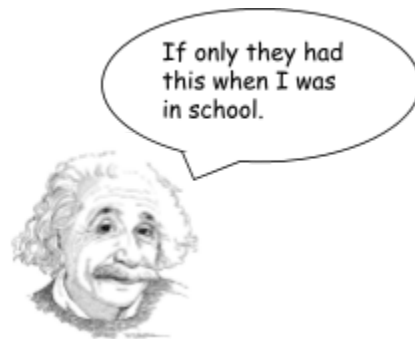


Photo Release Form

Physics Olympics

This signed document grants permission for photographs during the Physics Olympics event to be used by Long Island Physics Teachers Association (LIPTA) for publication on the LIPTA website, videos or newspaper.

School name: _____

Participant (print)

Signature

Date

Parent/guardian name
if participant is under 18 yrs

Signature

Date

★ 1 signed photo release form is required for each participating student and faculty advisor.

Duplicate for each participant (5 students and faculty advisor(s))
Additional forms can be obtained at www.lipta.org

T-shirt Contest

Do you have a flair for physics fashion? Show us your finest at the LI Physics Olympics. Our panel of experts will recognize, with a certificate, the team with the best physics T-shirts!

- Judging will be based solely on physics content.
Professional printing not necessary.
- For a team to qualify for this contest, the team's t-shirts must all have the same design.



Smithtown High School East



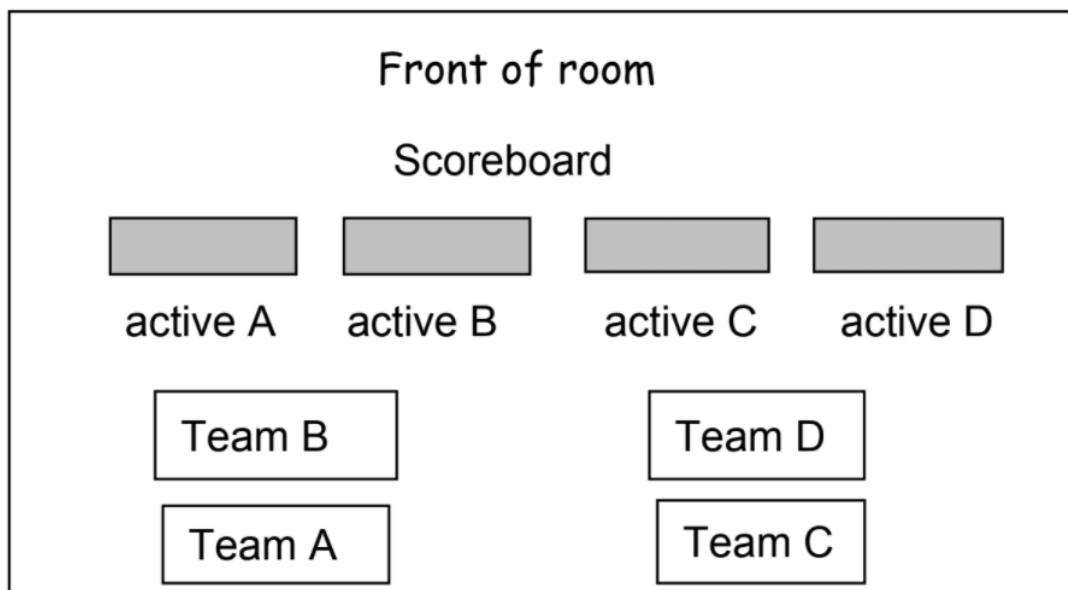
Physics Bowl

Objective:

To be the first team to score twenty points. First round winners will compete in the trophy round.

Rules:

1. All members of the team will participate. Three of the five members will be designated to rotate into the "active player" seat.
2. All questions will be multiple choice and based on the Regents Physics core mechanics syllabus. In the trophy round some questions will be at the honors level. Regents reference tables and paper will be provided. Scientific or graphing calculators may be brought and used.
3. One member of each team, the "active player", will sit at the shaded location, facing away from teammates. (See diagram)
4. The first team's "active player" to turn on the light will earn one point for the correct answer or lose two points for a wrong answer.
5. The teammates of the "active player" who answers correctly will have the right to try for a bonus point. To earn a bonus points, the remaining team members must answer the question correctly without help from the active player. Only one person may speak for the team. There is no penalty for an incorrect answer.
6. After each question, one of the three designated "active players" will rotate into the shaded location and will become the "active player" for the round.
7. The first team to reach twenty points will advance to the trophy round.



Fermi Questions



Objective:

To estimate quantities which are either difficult or impossible to measure directly.

Rules:

1. Each team will be provided with a list of Fermi questions.

An example of a Fermi question is:

How many drops of water are there in the Long Island Sound?

2. Answers are to be given to the nearest order of magnitude.

Example: Acceptable answer: 10^3

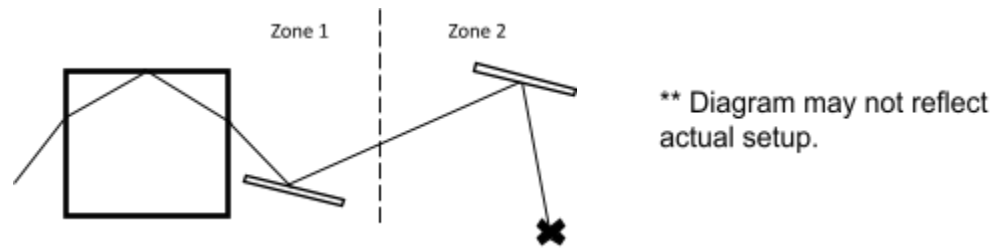
Unacceptable answer: 2×10^3

3. One point will be deducted for each answer which is not in acceptable form.
4. Questions must be answered in the allowed time.
5. Only one set of answers may be submitted by a team.
6. Calculators and other electronic devices are not permitted.
7. Reference materials are not permitted.
8. No work needs to be shown.
9. Each answer which agrees with the accepted answer will be awarded 10 points. One point will be subtracted for each order of magnitude different from the accepted value, to a minimum of 0 points.

Tiebreaker: The time to complete the event will serve as a tiebreaker.

Time limit: 15 minutes.

Laser Light Show



Objective:

To hit two mirrors and then a fixed target with a laser, by placing one plane mirror in zone 1 and a second plane mirror in zone 2. The laser light will pass through a transparent rectangular prism, so teams may wish to determine the index of refraction of the prism's material to help predict the path of the light. Students should also be aware of the possibility of total internal reflection at one of the prism-air interfaces.

Rules:

1. The timer begins when the team receives its prism and laser pointer. Teams are given the opportunity to determine the index of refraction of the prism's material. Protractors, rulers, and calculators will be available for use.
2. The team hands in the prism and laser pointer in exchange for a template indicating where the incident laser, prism, and target will be placed, as well as the locations of zone 1 and zone 2.
3. The team may draw on the template. The team must include a line to indicate where the reflective surface of mirror 1 is to be placed in zone 1, and where the reflective surface of mirror 2 is to be placed in zone 2, so that the laser spot will hit both mirrors and then the target. Mirrors will be front surface mirrors.
4. The timer stops when the team is ready to position the mirrors.
5. The score is the horizontal distance from the center of the target to the laser spot. Smallest distance wins.
6. All teams in which the laser beam fails to hit the 1st mirror will tie for last place. All teams in which the laser beam fails to hit the 2nd mirror will tie, and will be ahead of those teams in which the laser failed to hit the 1st mirror but behind those teams that were successful in hitting both mirrors.

Tiebreaker: the shortest time will serve as a tiebreaker.

Time limit: 15 minutes

Slow Roller



Objective:

To determine the time it will take for a faster rolling object to overtake a slower rolling object that has been given a predetermined head start. The objects will be released simultaneously on an incline. This is a linear acceleration event; students are *not* expected to calculate rotational quantities.

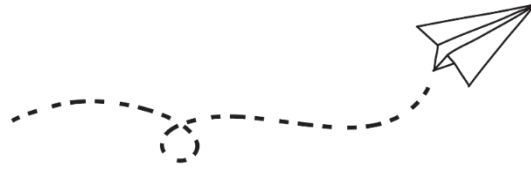
Rules:

1. Each team will be stationed at a pair of inclines and given two objects that roll with different accelerations. Objects have been designed to roll slowly.
2. Each team will be supplied with a stopwatch, a meter stick, a calculator and dry erase markers. Students may use the dry erase markers to temporarily make marks on the inclines.
3. After all data is collected, students will return both objects to the judges and then will be given the starting positions of both objects.
4. The team must calculate the time it will take the faster rolling object to overtake the slower rolling object, to the nearest hundredth of a second, and record this value on their score sheet. The score sheet is then returned to the judges.
5. When ready, the team will ask the judges to return the objects and team members will place them at the designated starting positions.
6. After a countdown, the objects will be released simultaneously by team members.
7. If the faster object overtakes the slower object in *less* time than predicted, the team's score will be the difference between the predicted time and the actual time. However, if the faster object overtakes the slower object in *more* time than predicted, the team will be assessed a penalty and the team's score will be *twice* the difference between the predicted time and the actual time.
8. The lowest score wins.

Tie breaker: The shortest time to complete the event will serve as a tiebreaker. A team's time will be measured from the moment the team is given its equipment until the team submits their score sheet.

Time limit: 15 minutes.

On the Glidepath (Aerial Accuracy; Aerodynamic Accuracy)



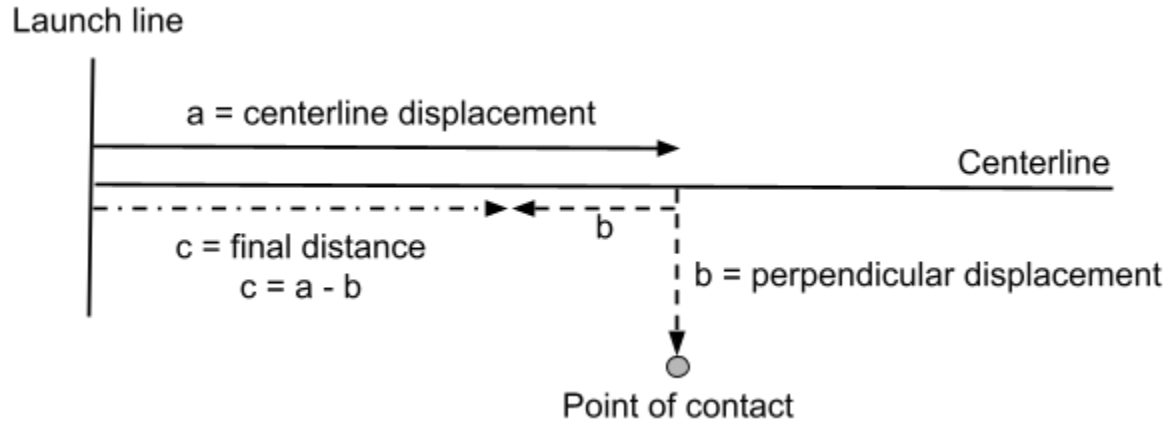
Objective:

To construct a paper airplane that team members will throw to achieve the maximum travel distance measured from a centerline marker.

Rules:

1. Each team will receive three sheets of standard 20 lb., 8.5 x 11, white copy paper; three standard smooth #1 paper clips (1 and 3/8 inches in length); and a pair of scissors. Using these materials, the team may construct up to three paper airplanes consisting of one piece of paper each. A paper sheet may be modified only by folding, cutting, or tearing. The entire sheet must be used. No gluing, taping, or stapling is allowed. The paper clips are provided for ballast, and only ONE paper clip per airplane may be attached at the team's discretion. Note, the airplane must have wings. Any attempt to merely crumple up and throw the paper will result in disqualification with zero points awarded to the team.
2. Teams will have a maximum of 10 minutes to construct their airplanes and practice with them. At the end of this time, ONE airplane will be chosen by the team for competition. Teams are advised to research construction of airplane designs and practice making and flying them before the day of competition.
3. Each team will get three trials with a different member throwing the airplane on each trial. The best trial will constitute the team's final score. Minor adjustments may be made to the airplane between trials to smooth out the surfaces, modify flight characteristics, or move the paper clip.
4. The airplane will be launched by one person standing behind the launch line marked on the floor of the hallway.
5. A centerline will be marked off in the middle of the hallway at right angles to the launch line. The flight goal is twofold: achieve the greatest distance from the launch line while coming closest to the centerline.
6. A trial ends when the plane hits the floor, a wall, or the ceiling. The distance will be measured from the point of initial contact as determined by the judges, not where the airplane comes to rest. Any trial that hits the ceiling will be considered out of bounds and will NOT be scored. There are NO "do-overs".
7. The score for a trial will be determined by first measuring the displacement component from the launch line along the centerline even with the point of contact. From this location, the perpendicular displacement to the point of contact will be measured. The perpendicular displacement will be subtracted from the centerline displacement to calculate the final distance score.

8. Teams will be ranked in order of decreasing final distance score for their best trial.



Tiebreakers: In the event of identical final distance scores, the team with the lower perpendicular displacement will be considered the winner. If teams are still tied, the second-best final distances will be compared with the better score being the winner.

Time limits: 10 minutes for construction and practice; 5 minutes for 3 trials