

REFERENCE INFORMATION

October 1, 2009

Dear Physics Teacher:

Competitions like the Canadian Association of Physicists Prize Exam, the Leonardo Da Vinci Prize Exam, and the Sir Isaac Newton Exam can be an exciting challenge, and can even provide or attract scholarships for university entrance. Here is a free, low-maintenance, no-strings-attached resource from the University of Toronto, which we hope will make it easier to guide students you have who are keen on science. At the same time, here is a point of entry for students who hope for the absolute top: to compete and win a place on Canada's national team to the International Physics Olympiad.

If you can afford the time, we hope you can help by distributing this material to your science teachers, and serving as a liaison teacher who will agree to mail student solutions back to us when done. If this is not possible, please pass this material either to a volunteer who *is* able to serve as liaison, or else directly to the students — perhaps the Science Club in your school. Even failing these, it is still possible for students to participate directly, via our POPTOR (Physics Olympiad Preparation Program) home page at www.physics.utoronto.ca/outreach/poptor.

The Physics Olympiad

Every year, Canada conducts a search for the most outstanding high school science students. Five are ultimately chosen to form the team to represent Canada in the International Physics Olympiad (IPhO) (www.jyu.fi/tdk/kastdk/olympiads). This ten-day meeting, begun among Eastern European countries in 1967, is a remarkable annual competition among students from about 60 countries, who come together to try out their experimental and theoretical physics talent. Canadian or Canadian-resident students who participate in POPTOR may earn an invitation to the national training and selection camp for Canada's team.

POPTOR is a year-long physics resource and preparation program for students, especially those in Ontario. This program helps science students gear up for the national prize-exams like the CAP exam, and provides them — and the non-competitive as well — with an opportunity to broaden their exposure to physics. Beyond that, it is the best preparation for students who want to compete for a place on Canada's team at the IPhO. POPTOR participants have won numerous awards at the IPhO in recent years (gold, silver, and bronze); at the 2009 IPhO, a POPTOR participant won a silver medal, along with two other Canadian students who won bronze and honourable mention.

The POPTOR Program

The POPTOR program consists chiefly of six carefully composed, sometimes amusing question sets due at regular intervals during the year, and a training camp in May at the University of Toronto. A liaison teacher at each school distributes the problem sets to the participating students, collects their answers and sends them to us for correction and comment. We return the hand-corrected problems to the students along with detailed solutions.

In addition to the questions and solutions, we also provide a web site with all the current and much past-year materials, plus a few extra goodies in the way of comments or illustrations of the physics in the question-sets, links to other science sites we have found, etc.

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The top twenty students are invited to attend an all-expense-paid weekend training camp held on the campus of the University of Toronto, involving familiarizing tour around the Department of Physics and its most interesting research groups, lectures, demonstrations, problem-solving tutorials, and experimental competition. It is important to participate in the POPTOR Weekend, because this is the single experimental competition preceding the National Finals. On the final day, students write a special Final Exam which is used by the Canadian Chemistry and Physics Olympiad (CCPO) in selecting the invitees to the national camp soon after. The five top Ontario students are selected for the national team basing on their results in POPTOR (theoretical and experimental), CAP Exam that is held in early April, and Final Exam.

Physics Activities

The Physics Department at the University of Toronto arranges a variety of outreach activities throughout the year, aimed at scientists, teachers, students, and the general public. These activities will be advertized on the Physics website as the year progresses. Other universities in your area will also have similar programs. We encourage you and your students to participate in events and attend lectures, as it is a great opportunity for students to learn what goes on in Canada's leading physics departments.

A Final Comment

We know that the success of this program has always depended on the enthusiasm and involvement of key teachers in each school, and we would like to assist you in whatever way possible to ensure that this is as rewarding an experience as possible for you and your students. Please contact us if you have any questions or suggestions, either through the address above, fax (416-946-3236), or *preferably* by e-mail (poptor@physics.utoronto.ca). We hope to hear from you and your students.

On the behalf of all POPTOR team,

Yours sincerely,

Dr. Nigel Edwards and Catherine Robin

POPTOR Coordinators

Encl: Reference information

POPTOR Registration form

Problem Set Cover Sheet

Problem Set 1

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Registration in POPTOR

To set up our database, we are enclosing a registration form to be filled out and returned to us by the first due date. We are also enclosing the first of six problem sets that should be duplicated and distributed to interested students. Their solutions should be returned to us by October 30. Around that time — only to schools who have registered with us — we will mail out copies of the remaining five problem sets, and also make them available for download from our POPTOR web site (www.physics.utoronto.ca/poptor).

Problem Sets and Due Dates

The topics and due dates of the six problem sets are:

General Physics	Monday, November 2, 2009
Mechanics	Monday, December 7, 2009
Thermodynamics	Monday, January 11, 2010
Optics and Waves	Monday, February 8, 2010
Electricity and Magnetism	Monday, March 8, 2010
AC Circuits, Electronics, and General	Monday, April 5, 2010

It is important that the students' solutions be returned by the due date so that we can mark and return them while their interest holds. The enclosed cover sheet should be copied, completed, and attached to each problem set. Correspondence can be addressed to:

POPTOR

Department of Physics

University of Toronto

60 St. George Street

Toronto, ON M5S 1A7

Please note that the questions are meant to be challenging, and we hope students will not be discouraged if they have trouble solving more than half of them! The problems are usually designed to be solved without calculus, although in a few cases an easier solution is possible using such advanced techniques. If any calculus is necessary it will only be of the simplest kind and we will give some hints.

Many schools supplement the preparation provided by POPTOR with their own problem solving sessions and discussions. This is a great idea, but please use *past-year's* questions rather than focusing on the assigned problems, since these are being used for evaluation purposes as well as for preparation.

We *prefer* that problem sets be returned by mail, but they can be faxed to 416-946-3236.

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Other Resources

POPTOR Website

We also maintain a POPTOR website on the Internet:

www.physics.utoronto.ca/poptor

This site provides up-to-date news about POPTOR including any corrections, question sets for this year (and solutions as they become available) in the convenient Adobe Acrobat™ PDF format (suited for viewing or printing on any computer), photos and illustrations that show how the questions connect with every-day or other-world situations, evaluated links to useful or interesting science web-pages, other resources and helpful textbooks, and previous years' problem sets and solutions. Comments on what you find useful (and otherwise) are much appreciated!

Some useful textbooks:

We encourage students to search out additional information on the problems by consulting reference sources. The best references are any good, modern first year college physics text, such as these currently used at the University of Toronto:

Fundamentals of Physics,

David Halliday, Robert Resnick and Jearl Walker, J. Wiley & Sons

Physics, John D. Cutnell and Kenneth W. Johnson, J. Wiley & Sons

Physics for Scientists and Engineers, with Modern Physics,

Richard Wolfson and Jay M. Pasachoff, Addison-Wesley

Additional collections of solved problems are given in:

The Physics Problem Solver, James Ogden, Research and Education Foundation

3,000 Solved Problems in Physics (Schaum's Solved Problems Series),

Alvin Halpern, McGraw-Hill

Schaum's Outline of Applied Physics, Arthur Beiser, McGraw-Hill