The fifth open Experimental Physics Olympiad (EPO5)
Saturday 9 December 2017 Sofia
The Day of the Electron

Email of the Olympiad : epo@bgphysics.eu
Gallery of former Olympiads: http://pc.cd/xeb
Tasks from former Olympiads:
http://arxiv.org/pdf/1511.04328, http://arxiv.org/pdf/1602.06114,
http://arxiv.org/pdf/1602.08090, https://arxiv.org/pdf/1605.00493.pdf

The Sofia Branch (SB) of the Union of Physicists in Bulgaria (UPB) with the assistance of the Physics Faculty of Sofia University St. Clement of Ohrid and Regional Inspectorate of Education Sofia City is organizing the 5th open Experimental Physics Olympiad for secondary (high, gymnasium) school students (grades 7-12). Co-organizer for the event is the Society of Physicists of the FY Republic of Macedonia, Strumica, and as a whole it is an activity of Balkan Physical Union (BPU). Similarly to the former Olympiads, this year's competition will be a Day of electron; the experimental assignment at the Olympiad will include investigation of electric phenomena using electronic devices.

The Sofia branch of the UPB has been organizing these Olympic competitions since 2011, and over time they became a traditional part of the informal out of school education in physics. Each student will be placed in an age group called S, M and L, according to the grade in which they study. For example, for the Bulgarian school system S would correspond to students enrolled in grades 7 and 8, M to 9 and 10 and L to11 and 12 grades. A separate group of university students will compete in XL category. Each one of the age groups will have its own ranking. Students that are in their preparatory year and are not studying physics may also participate in the Olympiad and will be placed in group S. The assignment at the Olympiad is a collection of many related multipart problems with increasing difficulty. Experimental assignments make up the main portion of problems given to students. However, there will also be several theoretical questions which will help to assess student's ability to solve a problem.

Registration for the Olympiad can be done only electronically. For the guests of the country the deadline for registration is **November 1, 2017**. For further details on the registration, see the end of this message. Applications for participation in the Olympiad are accepted until the specified deadlines. The most up to date version of this message is available here: http://bgphysics.eu.

Motivation

Physics teachers in the past have regularly expressed certain hesitations regarding their participation in the Olympiad. Some may not feel adequately prepared in the field of electric phenomena and electronics. We, the organizers, would like to emphasize that we are making our best efforts to allow physicists-enthusiasts, who love a challenge and strive to expand their knowledge, to participate in the Olympiad. We believe that the experimental setups developed for the Olympiad participants will help improve the overall education in Physics and stimulate and motivate the students to continue their education in science and technology. Also, the experimental setups will help in the renovation of the physics classrooms and enhance the future work and professional growth of physics teachers. We expect the future Olympiads in experimental physics to become an important forum of fellow physics teachers, supplementing the social life of the Collegiate. The analysis of the four previous Olympiads showed that even untrained students learnt a lot via their participation in the Olympiads and later were able to

demonstrate the new knowledge to their classmates. In addition, the Olympiads complement extracurricular training which is critical for preparation of future science and technology professionals.

Rules and program

Students will be required to complete all assignments individually on their own. Experimental setups will be provided by the organizers.

Registration *on the day of the Olympiad,* Saturday December 9, will take place from 8:30 to **9:30 in the lecture hall A209 of the Faculty of Physics, 5 James Bouchier Blvd. The Olympiad will be officially opened at 9:30**. Students have to wear an ID and upon registration the participants will be divided into groups and put in different rooms. The Olympiads will run from 10:00 to 14:00. At 11:00 students will receive a sandwich and mineral water. The regulation prohibits the use of cell phones and devices giving Internet access; students need to hand over their phones to the accompanying teacher or a proctor. During the first 2 hours (i.e., until 12:00 pm) students are not allowed to leave the audience. At 14:00 all students have to submit their solutions and notes, including the experimental results, and then receive a certificate of participation. If desired, a student can also take a homework assignment which will be graded and rewarded separately.

Collocated with the Olympiad, an educational workshop will be held from 10:00 to 14:00 in the prof. Elisaveta Karamihajlova lecture hall A315. In the workshop the authors of the task will describe: investigated phenomenon, physical problem, experimental setup, and measurements. Registered teachers will use their own setup. This workshop is open to all interested teachers and accompanying parents. Regular registered teachers receive a diploma for successful completion of the workshop. During the brake it is possible to go for a croissant and coffee near to the faculty.

After finishing the Olympiad the teachers or accompanying persons have to lead students in some restaurant close to the faculty, please address to the organizers for a bit of advice.

The jury designated by SB of UPB, will announce the results of the students' rankings at 10:00 on the next day, Sunday 10.12.2017 in the lecture hall A315 and the diplomas for the 3rd, 2nd, 1st prize, absolute champion and special awards will be presented. Full list of ranking points will be published on the website of the SB of the UPB http://bgphysics.eu a week after the Olympiad on 16.12.2017.

With any comments and/or suggestions you can reach the organizing committee at epo@bgphysics.eu .

Preparation for the Olympiad: Methodological Guide

All measurements will be made with multimeters; students have to carry with them 2 multimeters. Students have to be familiar with their scales and limitations; with their internal resistance for example. The participants have to have some experience with processing of experimental data with their calculator.

In addition to assembling electric circuits and performing measurements, it is required from the participants to be able to present the experimental results in the form of tables and graphs. Some problems will be associated with graphical representation of the experimental data. It is assumed that the student may submit experimental data on graph paper and perform data analysis based on the graph; to draw linear regression and to evaluate the slope and the constant term, for example.

The assembly of simple electric circuits and their analysis has been the basis of experimental tasks of former Olympiads. We are repeating: ***Participants must carry with them one calculator and two digital multimeters and be experienced with using them.*** If the multimeter is connected as an ammeter, do not attempt to measure the maximum current supplied by the battery since this drains the battery quickly

and it may damage the multimeter. The proctors will be monitoring that the students are using **only the following aids: multimeters, calculator, pen and pencil and ruler**.

Organizational issues:

1. For up to date version of the program refer to the website of the Sofia branch of the UPB http://bgphysics.eu/ The most important thing to check is whether your name is included in the list of registered participants, which will be published on the website on November 2, 2017.
2. Participation slots for the Olympiad are filled in order of registration of participants and are limited by the number of experimental setups prepared.
3. The Committee for the carrying out of the Olympiad, is determined by the Sofia branch of the UPB, includes the authors of experiments and fellow physicists.
4. Participants in the competition will receive a certificate of participation. The ranking results will be published on the website of the SB of UPB.
5. All problems presented to the participants are copyrighted, original and not published until the start of the Olympiad.
6. To participate in the Olympiad it is not required to have special training. The organizers encourage the participation of all students, regardless of their age, who can use a multimeter and make simple measurements. More junior students are also encouraged to participate in order to gain experience for the future Olympiads.
7. Students are required to bring with them only the following aids: 2 multimeters, calculator, ruler and something to write with. Mobile telephones and all Internet devices in the lecture hall for the duration of the competition are forbidden.
8. Participants make travel arrangements to Sofia Bulgaria on their own.
9. Late participants would need to arrange for their accommodation on their own.

Feedback

We the organizers value the opinions and suggestions of the other physics teachers and educators, for the problems given at the Experimental Physics Olympiad. Each teacher accompanying a registered student will be given the opportunity to review the problems and the experimental setup in a separate auditorium. Teachers will obtain certificate for participation in the course. Your opinion is indispensable for the preparation of the next editions of the Olympiad.

Registration for participation

1) The registration fee for participation of **30BGN (15 EUR)** for each participating student and teacher at the day of the Olympiad for the international participants guests of the country.
2) Fill in the on-line registration form different *for students* https://goo.gl/forms/DEpi2oRVXq7Dbc8I1 and *for teachers* https://goo.gl/forms/QVtaEKJhihGYS3m32 by **November 1, 2017**.
3) A student is considered registered if he/she completes the registration form by the deadline specified above.
4) For the registered participants (students and teachers) upon request in the registration form the accommodation for the nights 8th and 9th of December 2017 is provided by the sponsors in the Centre for the preparation of students for the Olympic Games.
The address is:

"Centre for the preparation of students` for the Olympiads"

Gr. Sofia 1113, Bull. Dragan Tsankov 21A
http://mon-coo.com
Training Center u.centar@abv.bg Tel./fax: +359 2 .873-83-57
The location of the Centre can be found on the following map:
https://www.google.com/maps/place/bul.+%22Dragan+Tsankov%22+21-%D0%90,+1113+Sofia,+Bulgaria/@42.6712657,23.3520538,18z/data=!4m2!3m1!1s0x40aa85c969c6f66b:0xa1338a90c90d15f5

If you use the subway, get off at the stop "Joliot-Curie" (http://www.sofia-guide.com/business/joliot-curie-metro-station/). There is an pizza restaurant close to the Centre, but if your arriving in 08.12.2017 is in the late evening it is better to carry with you some organic matter.

5) The list of registered students and a separate list of accompanying registered teachers will be posted on the website of the Sofia Branch of UPB on November 6, 2017 and the accommodation is provided for both

6) Teachers accompanying students and receiving a certificate of participation in the training course are also required to register by November 1, 2017 on a separate registration form (see link for teachers in point 2).

7) Participation of late entrants may also be possible; there will be announcement on the Web site of the Sofia Branch of UPB.

8) For participants from Bulgaria, the participation fee is payable only via transfer to the bank account of the Union of Physicists in Bulgaria, which serves Sofia Branch:
Bank: UniCreditBulbank, Branch “Sveta Nedelja”, Sofia
IBAN: BG91UNCR70001520373231
SWIFT (BIC): UNCRBGSF
Sveta Nedelya Sq. №7, BG1000 Sofia, Bulgaria.

9) For accounting, participants can receive an invoice issued by SB of UPB upon request.

If you have any questions do not hesitate to write to the email address of the Olympiad epo@bgphysics.eu (the abbreviation comes from the Experimental Physics Olympiad).

Latest version of this message 29.07.2017. For the current version of the message visit
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