PHYSICS CUP - TALTECH 2019

Regulations **Version: 1.0**

About Physics Cup - 2019. This year, the competition is sponsored by TalTech — Tallinn University of Technology. This means that there will be a budget for awards. While majority of the problems will be presided by me (J.K.), Máté Vigh has kindly agreed to preside one of the problems.

Eligibility and registration. There are two official age groups: pre-university, and university. Anyone who qualifies for the next IPhO qualifies also for the pre-university age group. All BSc and MSc students of any university qualify for the university age group.

To register, please send e-mail to physcs.cup@gmail.com indicating:
YOUR GIVEN NAME;
FAMILY NAME;
DATE OF BIRTH;
E-MAIL ADDRESS;
FULL MAILING ADDRESS;
AGE GROUP (PRE-UNIVERSITY OR UNIVERSITY)
SCHOOL/UNIVERSITY;
PHYSICS TEACHER (FOR PRE-UNIVERSITY CONTESTANTS).

The first problem of the Physics Cup - 2019 will be published at **2 pm (GMT), 9th December 2018**. It is advisable to register before that. However, if you miss the beginning of the competition, you can also register (and start solving the active problem) at any later stage.

Distribution of problems: At 2 pm (GMT) of the second Sunday of each month, between December 2018 and April 2019, a new problem is published at https://www.ioc.ee/~kalda/ipho/PhysicsCup2019/ and also sent by e-mail to all the registered participants.

Adding hints and announcing intermediate results: At 2 pm (GMT) of each Sunday (except for the second Monday of a month), a new hint is added to the currently active problem; the names of those who have solved the problem correctly will be listed at the end of the (the updated problem file will be posted to the registered participants and published on the web page). Around the same time, everyone who has submitted a solution during the last week will receive a notification if their solution was correct or not.

Submitting the solutions: all solutions are to be sent by e-mail to physcs.cup@gmail.com. Please use the subject line "Problem No 1" ("Problem No 2", etc), exactly as written here; the phrase "Problem No" anywhere within the subject line triggers an automatic reply confirming your submission.

You are advised to submit the answer as fast as you can, but not later than the publication time of the next problem. Since there is a speed bonus, you can first submit only the answer. In that case, you need to submit a full solution within the next 48 hours (failing to do so invalidates your answer-only submission).

Accepted formats: LaTeX, PDF, MsWord, jpg. You can scan (or take a photo) of your hand-written solution, or write it in LaTeX (recommended) or MsWord. You can produce also a semi-LaTeX text - a simple text file/e-mail using LaTeX syntax for formulae (e.g. m=m_0/\sqrt{1-v^2/c^2}).

Grading: the base score for each problem is 1.0 pts; if you earn a bonus or a penalty, this will be multiplied with appropriate factors. Either a full or zero credit is given; on a weekly basis, on Sundays, the competitors are notified if their solutions are correct, "almost correct", or incorrect. "Almost correct" stands for solutions with minor mistakes, e.g. a typo leading to an incorrect numeric prefactor. If the solution was not correct, contestants can continue sending new solutions until they manage to fix all mistakes; however, each "almost correct" solution incurs a penalty factor of 0.9, and each incorrect solution — a penalty factor of 0.8. Penalty will be smaller if the contestant detects the mistake by himself/herself, and submits a corrected solution before receiving a notification: 0.95 and 0.9, respectively.

The first 10 correct answers (supplemented later with a complete solution) receive a bonus factor according to the formula $k = 1.1^{11-n}$, where n is the order number. The best solution will receive a bonus factor of $\mathrm{e} = 2.718\ldots$ and will be published as the official solution at the web page. If there are several equally good "best solutions", this bonus factor can be shared (for instance, in the case of two "best solutions", each will get a factor of $\mathrm{e}^{1/2}$). If there are other good solutions which (due to certain reasons, e.g. the usage of a significantly different approach) deserve publication, these will be also published and will receive a bonus factor of 1.1. Chances of getting your solution published will be increased if you document your solution well, and write it down nicely (e.g. in LaTeX; a good scan of a clean hand-written work is OK, too).

There is also an additional rule for those who send many incorrect solutions before finding a correct one: if the product of all the factors (penalty and bonus) gives a number which is smaller than $\mathrm{e}^{-2/3}$, the score $\mathrm{e}^{-2/3}$ is used, instead.

Publication of results: The names and results of the students with best scores are published at the web-page; the list is updated monthly.

Distribution of awards and diplomas: diplomas will be sent by mail; wire transfer will be used for monetary awards; other awards will be handed over at EuPhO or IPhO, or if this is not possible, sent by mail.

What you need to derive and what you don't need to derive in your solutions: you can use the basic formulae related to the topics of IPhO Syllabus without proof, but everything which goes beyond that needs to be derived.

Jaan Kalda
Professor, Tallinn University of Technology