Physics Olympiad Archive

This archive includes all major Olympiads, as well as some rather obscure ones. The archive is somewhat skewed towards Eastern European competitions, but translation software goes a long way. I try to update it at least once a month. Because it's my personal archive, it contains items which are not exam papers, such as problem sets, statistics, and Olympiad results. I've left the results files in for the benefit of students, as they indicate the difficulty of the problems and allow for meaningful self-assessment.

Because high school physics competitions ($\leq$1894) predate the radio, it's clear that many problems have been lost to time. Beyond a certain point it gets hard for me to track down people who have saved the problems and are willing to hand them over. Hence, for any Olympiad here, if you spot any gaps more than a year old and you can fill them in, please email me!

Here are descriptions for some of the competitions in the archive:

- `IPhO` – This is the largest Physics Olympiad. There are three theoretical and one or two experimental problems. Massive syllabus, and certainly more emphasis on modern physics compared to Eastern European Olympiads. The problems are provided by the host country, so difficulty, style, and quality vary year to year. Generally, the level of the problems corresponds to first year university physics. In the last thirty years there has been a trend for the problems to grow larger and larger so that the questions can differentiate between contestants. I think that at this point they've become too bloated. In many IPhOs one can solve everything given enough time, but 5 hours would be enough only for someone who has seen this before and knows what to do immediately. You are also sometimes also told what to do explicitly, especially in the experiments, which reduces the whole thing to algebra and/or data crunching.

- `APhO` – Lots of time pressure like IPhO, but also much harder. In fact, this is probably the hardest one of the bunch. In theory the syllabus is the same as IPhO, but that syllabus doesn't specify how deep you can delve into a topic. The problems here tend to cover more conceptually difficult topics (condensed matter physics, 3D rotation, dielectrics, quantum mechanics), and they don't shy away from long calculations. Often the problems are adapted from physics journals, and they'll more closely resemble real theoretical work. In hindsight, some APhO problems would've served me well as preparation for second or third year university physics. If you're struggling with APhO, do not despair – the scores indicate that everyone finds it difficult.

- `EuPhO` – Calling for a return to the old ways, this Olympiad features short, tricky problems. The theory exam is authored by the same bunch of people so as to guarantee consistent style, though the problems have become a bit longer with time. After the initial marks are released, if there's disagreement, it's the contestants that appeal to the markers rather than the team leaders, which can be quite fun. Knowing how to appeal is very important and it can often bring you a shinier medal. EuPhO is a relatively young competition, but one can find enough relevant practice problems within NBPhO and 200 PPP.

- `ru` – Russian National Olympiad. Old as the hills and certainly an inspiration for EuPhO. Five very short theory problems for five hours, and tricky experiments with simple, DIY experimental kits. It's limited by the Russian school syllabus, so it's all classical mechanics, EM, thermo, and ray optics. And virtually no calculus. Because there are only so many related physical ideas, authors compensate with tricky maths (think ruler-and-compass constructions on lens diagrams). These problems are slick, but I've seen it rightly pointed out that the physical ideas behind them are still basic. So they are a guilty pleasure. Nevertheless, going through some Russian Olympiads helped me clear many misconceptions I had in my head. The team selection tests are IPhO-style and they're very tough, see xy.pho.rs.

- `NBPhO` – Nordic-Baltic Olympiad. This competition, like EuPhO, is managed by Jaan Kalda. It is similar in spirit to the Russian Olympiad, but perhaps with more emphasis on real-world

applications like electronics, heating devices, and optical phenomena. It is unique in that the participants solve a few theoretical problems and one experimental problem at the same time. It's a personal favourite, though the solutions to the problems are often unclear and riddled with typos.

- `IEPhO` – International Experimental Physics Olympiad. Not really international, but it has its charms. The Olympiad consists of three Russian-style experimental rounds. It has different age groups with separate problems. The Russians use it to practice for their own experimental exam, but it can be helpful for EuPhO as well. Most problems can also be found at ie.pho.rs.

- `IZhO` – International Zhautykov Olympiad. Named after a Kazakh mathematician, this Olympiad also covers Mathematics and Informatics. Teams are associated with schools rather than countries. It has my favourite theory exam. The first problem is always three independent short tasks (like in IPhO 2014 and IPhO 2020), while the other two problems are longer; they strike a good balance between thinking and bashing. For some reason this exam is only four hours long even though it warrants five! The experimental problems are much easier. I suppose they're being kind to people who've never had the chance to practice these. Even though IZhO is harder than IPhO, it's much easier to get a medal here because the participants are generally weaker. Be careful with the official solutions, there are lots of minor errors.

- `USAPhO` – US National Olympiad. You qualify for this through $F = ma$, a mechanics-only contest. USAPhO has two sections, each consisting of three problems for 90 minutes. The problems cover the IPhO syllabus, and there is an emphasis on modern physics – special relativity features often, and sometimes problems are adapted from papers. In the last few years the problems have become both longer and harder, so if you're just starting off, I recommend checking the older papers first. The marking schemes and the results are not made available publicly, which is a puzzling design choice.

- `RMPh` – Romanian Master of Physics. An IPhO-style competition in Bucharest which is held sporadically and attended mostly by Balkan countries. Sometimes recycles popular physics problems. I can't exactly pinpoint why, but it feels a bit off. Maybe it's because there is a problem on general relativity every other year.

- `bg` – Bulgarian National Olympiad. Split into age groups (from 7 to 12, plus "spec", which is used as an IPhO qualifier). The problems are similar to USAPhO in length. In the grand scheme of things they are not that hard (though one still needs to practice if inexperienced with the syllabus). Each age group is assigned to a single problem author. Their styles vary from very Russian to very Western, and with time one learns to recognise them. This invites a good deal of meta-gaming, which is fun but doesn't help with learning physics.

- `MB` – Concours Minko Balkanski. This is a Bulgarian competition (in French and English) which emulates the French grande école entrance tests. These exams are an interesting tradition not widely known outside France. The physics exam feels a lot like IPhO, but you usually get a single problem with about 50 subtasks that encompass many areas of physics. There used to be a website called sujets.net which had many past papers, but it's been taken down. If you happen to still have the files, I'd be happy if you sent them to me.

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