Problems of the 2nd International Physics Olympiads (Budapest, Hungary, 1968)

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Abstract

After a short introduction the problems of the 2nd and the 9th International Physics Olympiad, organized in Budapest, Hungary, 1968 and 1976, and their solutions are presented.

Introduction

Following the initiative of Dr. Waldemar Gorzkowski [1] I present the problems and solutions of the 2nd and the 9th International Physics Olympiad, organized by Hungary. I have used Prof. Rezső Kunfalvi's problem collection [2], its Hungarian version [3] and in the case of the 9th Olympiad the original Hungarian problem sheet given to the students (my own copy). Besides the digitalization of the text, the equations and the figures it has been made only small corrections where it was needed (type mistakes, small grammatical changes). I omitted old units, where both old and SI units were given, and converted them into SI units, where it was necessary.

If we compare the problem sheets of the early Olympiads with the last ones, we can realize at once the difference in length. It is not so easy to judge the difficulty of the problems, but the solutions are surely much shorter.

The problems of the 2nd Olympiad followed the more than hundred years tradition of physics competitions in Hungary. The tasks of the most important Hungarian theoretical physics competition (Eötvös Competition), for example, are always very short. Sometimes the solution is only a few lines, too, but to find the idea for this solution is rather difficult.

Of the 9th Olympiad I have personal memories; I was the youngest member of the Hungarian team. The problems of this Olympiad were collected and partly invented by Miklós Vermes, a legendary and famous Hungarian secondary school physics teacher. In the first problem only the detailed investigation of the stability was unusual, in the second problem one could forget to subtract the work of the atmospheric pressure, but the fully "open" third problem was really unexpected for us.

The experimental problem was difficult in the same way: in contrast to the Olympiads of today we got no instructions how to measure. (In the last years the only similarly open experimental problem was the investigation of "The magnetic puck" in Leicester, 2000, a really nice problem by Cyril Isenberg.) The challenge was not to perform many-many measurements in a short time, but to find out what to measure and how to do it.

Of course, the evaluating of such open problems is very difficult, especially for several hundred students. But in the 9th Olympiad, for example, only ten countries participated and the same person could read, compare, grade and mark all of the solutions.

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Theoretical problems

Problem 1

On an inclined plane of 30° a block, mass m_2 = 4 kg, is joined by a light cord to a solid cylinder, mass m_1 = 8 kg, radius r = 5 cm (*Fig. 1*). Find the acceleration if the bodies are released. The coefficient of friction between the block and the inclined plane μ = 0.2. Friction at the bearing and rolling friction are negligible.

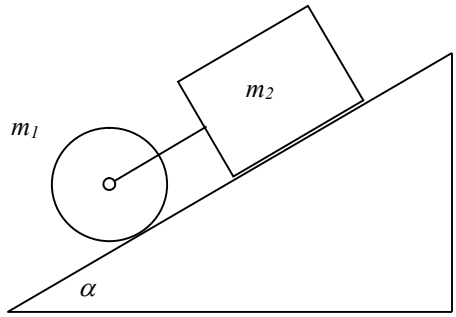

Figure 1