

# Experimental Problems at FYKOS

Karel Kolář<sup>1</sup>

<sup>1</sup>*Faculty of Mathematics and Physics, Charles University, Czech Republic*

## Abstract

This contribution discusses experimental problems in FYKOS. FYKOS stands for The Internet Physics Competition (<http://fykos.org>), organized and prepared by university students (ISCED<sup>1</sup> 5, 6 & 7; organizers) for high school students (ISCED 3; participants). FYKOS experimental tasks should develop the scientific reasoning of participants and also their skills in writing experimental papers and presenting their results in written form.

The “FYKOS year”, which is congruent with the school year, consists of 6 sets of 8 problems, one of them is experimental in each set. The participants can be from any country, if they are able to solve problems in Czech (or Slovak) or English. They have roughly one month for solving of each set and then send their solutions by post or email.

The experimental problems in FYKOS vary, but they have in common that tools which are needed for realisation and processing of the experiment should be accessible for high school students (with respect to the current curricula in the Czech Republic). So, they can be roughly divided into three categories

1. The low cost experiments
2. The experiments demanding a camera usage (available on smartphones), a computer or some tool which could be borrowed in a usual Physics school laboratories at most of high schools
3. The experiments with some material which FYKOS sends to the participants by post

Examples of such problems are

1. 29-IV-Exp<sup>2</sup> (*break it down*): Measure the tensile strength of office paper. Use a common office paper with the density of  $80 \text{ g}\cdot\text{m}^{-2}$ .
  - In Czech version it was required to measure the paper of the brochure which was sent to the participants by post. But in principle it could be done with any paper.

---

<sup>1</sup> ISCED: International Standard Classification of Education - See more at: <http://www.uis.unesco.org/Education/Pages/international-standard-classification-of-education.aspx>

<sup>2</sup> The FYKOS problems are labeled by such abbreviations – this example is a problem of the 29<sup>th</sup> year, its 6<sup>th</sup> series and it is an “Experimental task.”

- It is a very easy experiment – participants only had to solve the problem how to affix the ends of the paper and then the measurement itself is not complicated.
2. 28-I-Exp (*charged potato*): Measure the load characteristic of a potato as a source of electric voltage with electrodes made from different metals.
    - Participants had to borrow voltmeter and ammeter and some resistors.
  3. 29-III-Exp (*hydrogel*): Examine the dependence of weight of a hydrogel ball on time of submersion in water and on concentration of salt dissolved in the water.

Note: We do not send the experimental material abroad, therefore foreign participants must buy the hydrogel described in detail.

- Small bags of hydrogel were sent to participants and they needed kitchen scale to measure the weight of hydrogel.

Previous problem assignments from the 18<sup>th</sup> year of the competition till now (29<sup>th</sup> year) can be found on the web pages of FYKOS (<http://fykos.org/problems>) both in Czech and English. Problem solutions are only in Czech (or Slovak).

The poster contribution will present the experiences with these problems – more examples of them, examples of participant's solutions and organizer's solutions. There will be a live presentation of some experiments in front of the poster.

### **Keywords**

Physics competition, low cost experiments, internet competition, correspondence competition, FYKOS

### **Acknowledgement**

The activities of FYKOS are funded by the Faculty of Mathematics and Physics of Charles University. The presentation was supported by the Charles University (in Prague), project GA UK No 188515.