

SCEINCE CUP – NEWTON 2018



**POHÁR VĚDY
SCIENCE CUP**

Category 3 – Secondary School

3rd round – March – deadline 31. 3. 2018 23:59



Introduction

Dear participants, we are over the first half of the competition, evaluating your second rounds' NEWTON 2018 Science Cup solutions already. The tasks of the third round are already waiting for you, but prior their solving, let's remind us several most important information again.

The solution of each round needs to be uploaded not later than on the last day of the given month, by 23:59.

The solution has to be uploaded before the deadline to the web interface as one file in PDF format not exceeding 10 MB in size. All the content of the solution (texts, drawings, schemes, photos) cannot exceed 3 pages of A4 paper format, and should be easily readable (simple font, minimal font size 11 pt).

And finally lets us remind that for your presentation during the final, your team would have ONLY a table or a school desk of 80 x 150 cm in size and the proximate surroundings of 10 cm around the table. You would not be able to use any additional space.

Yours NEWTON 2018 team

1. Creativity (20 %)

An apple could be found in the culture for thousands of years. For Christians, it is a symbol of the first sin – reaping a forbidden fruit from a tree of knowledge is traditionally associated with an apple. From the Greek mythology, a golden apple from the Hesperide Garden with the inscription "To the Most Beautiful" was the reason of an argument among Goddess that Paris was supposed to solve. This apple stood at the beginning of the events that led to the Trojan War and the later fall of Troy. And what about the apple falling on Newton's head? In fact, in the manuscript that was a preparation for the biography of Isaac Newton, archaeologist William Stukeley commented on Newton's narrative, according to which Newton really was inspired the formulation of the gravitational law by the view of the falling apple. But the apple fell into the grass and not on Newton's head.



Picture downloaded from: http://dreamicus.com/adam-and-eve.html#photo_4

Your creativity task in this round would not be a traditional one.

Include an apple to one of your favorite physical or chemical experiments.

The apple can be in any form = fresh apple, dried apple slices, apple juice, apple vinegar, apple soap, apple puree... You can take photos or draw the experiment, do not forget to describe and explain it properly.



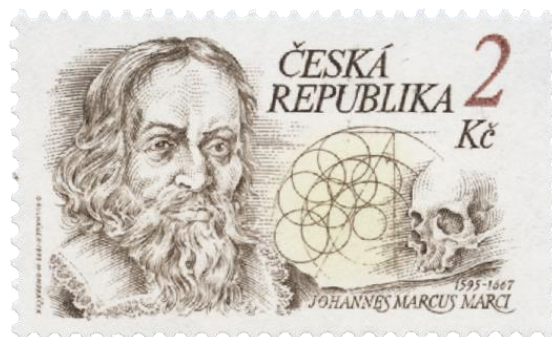
Photo by J. Soukupova

Have the experiment ready also for the presentation at the table during the final round. The experiment, however, is not supposed to be shown on the stage.

2. Theory and research (30 %)

More than 300 years ago, an English scientist, Isaac Newton, published book called Opticks (1704), one of his most important natural scientific works. Newton was the first one to prove experimentally that white light consists of color spectrum, and he also made a detailed analysis of the consequences of the refraction and reflection laws. Based on these findings and laws, in 1668 he constructed and built the first mirror stargazing telescope.

- Find the occasions where in practice the principle of subtractive and additive color mixing is used, and what are the two differences between the two ways of mixing colors?
- Explore how white light spreads through a clear, colored and opaque glass, and describe your research and conclusions. You can use glasses, colored bottles, opaque covers from lights, and so on.
- Who was Jan Marek Marci and in what has he "outrun" Isaac Newton?



Picture downloaded from: <https://www.filaso.cz/katalog-znamky/44/1995-vyroci-osobnosti>

3. Practice and project (50 %)

For the third time already, we say „Let Newton be“, and this time also “Let there be light”, and we suggest your beginning of experimenting on optics together with Isaac Newton.

Make an experiment or a model/toy showing principle of the decomposition or composition of colors.

The experiment, model or toy should be described – materials used, procedure, and the principle explanation. Document your work also with pictures or photos.

Again, there is no limit to your fantasy; choose any experiment, model, or toy you wish. Some examples may be found in the following pictures.

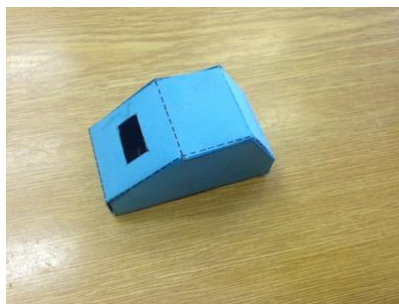


Photo by V. Pejcochova, J. Soukupova, V. Erhartova

Describe the solution procedure of each task, the results of your team work, and any additional information, and document them with photos.

The solution can be handed in only before the deadline. Only the solutions fulfilling all the requisites given in the propositions will be judged.

If you have any questions, you can ask a category consultant in your country:

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