



Problems of the extramural round
VI International Natural Sciences Tournament, 2015

1. To drink or not to drink?

Many people face a choice – to drink bottled water or to use water from wells, springs or tap water, the purity of which is most often unknown and may be subject to seasonal fluctuations, but to seek its laboratory analysis is expensive, inconvenient and sometimes impossible. For example, in Vietnam and other countries in Southeast Asia the permissible concentrations of arsenic and heavy metals in well water are often significantly exceeded. In Canada there is a different problem – tap water is usually pretty clean, but the people, not being able to check this, still prefer to use bottled water.

However, the continued used of bottled water is not only quite expensive, but also harmful to the environment. After all, the manufacture and recycling of plastic bottles leads to additional energy costs and environmental pollution. A detector that allows you to quickly and cheaply in situ assess the quality of water could solve the problem.

Suggest a low cost method to determine the quality of water at home according to any parameters you offer to characterize its safety and potability. Consider whether travelers can use the method you proposed during a camping trip.

2. Adrenochrome

It is known that the oxidation of the hormone adrenaline (both in vitro and in vivo) results in the formation of adrenochrome which is a substance with high biological activity as well as hallucinogenic properties. According to an existing hypothesis, the increased formation of adrenochrome in humans causes schizophrenia.

Consider the possible factors that lead to excessive oxidation of adrenaline to adrenochrome in the human body and suggest a method of controlling this phenomenon.

3. Submarine pipeline

Currently submarine oil and gas pipeline networks are being actively designed and constructed worldwide. One of the problems with operating such structures is the formation of cracks which leads to pipeline ruptures followed by gas and oil leaks. This can cause tragic environmental and economic consequences.

Come up with an efficient and economical system for detecting internal and external crack formation on early stages in an oil or gas pipeline which lies on the seabed.



International Natural Sciences Tournament, 2010-2015

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In 2015 the intramural round of the Tournament is separated in two leagues: International (English-speaking) league and the Russian-speaking league. Participants of the International league perform both the extramural and intramural rounds of the Tournament in English. Teams of the Russian-speaking league prepare their solutions in Russian.

Teams, which would like to participate in the International league, should send the solutions of tasks of the extramural round until **June 25, 2015**.

You should send solutions of all three proposed problems. Solution for each problem consists of 2 files: presentation in PowerPoint (or PDF) and extended solution in .doc format (5 pages or less).

Please, send solutions to the e-mail: participants@scitourn.com

Please, register if you are going to participate in the Tournament.

International league registration: www.scitourn.com/reg

Do not hesitate to ask questions to International league coordinator:

Mr. Kirill Volosnikov

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