



## Qualifying problems (extramural round) IV International Natural Sciences Tournament, 2013

### 1. Engry cells

Extraction efficiency of cellular material from the complex inorganic and organic matrixes greatly influences the final result of sample preparation. It is often required to remove cells from complex heterogeneous mixtures containing solids remains, liquids, and variety of high molecular weight organic substances. Propose new approaches for fast (less than 4 hours) extraction of cells from these mixtures, followed by concentration of the cell material in a small volume of liquid. In the process cells should **not** be lysed.

### 2. One dollar – two

Materials for bodies of drinking water filters should be as safe and inert as possible. Currently used polyethylene and polypropylene have relatively low strength properties. When using any crosslinkers, fillers and other additives, there is a high chance that these materials or their degradation products can get into the drinking water. Suggest a safe material for water purifier body, comfortable to handle, and tolerant to the following operating conditions at a reasonable wall thickness:  $0\text{ }^{\circ}\text{C} < t < 100\text{ }^{\circ}\text{C}$ ,  $4 < \text{pH} < 10$ ,  $0,5\text{ atm} < p < 10\text{atm}$ ,  $\text{O}_2$ , UV irradiation (germicidal lamp) for 3 years and having a value not greater than 1 \$ / kg.

### 3. Sochi

A good choice of professional sports equipment for winter first-class competitions is the most important aspect of the team's training. Sometimes athletes choose skis from about a hundred pairs. However, failed performances and missed gold medals are often blamed on inventory. Suggest technology to create the fastest, and most importantly - the universal skis for any snow conditions.

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To participate in the intramural round of the Tournament, please send solutions of at least two of the three offered problems **before September 20, 2013**. The teams that sent solutions for three problems, the scores for extramural round will be calculated as the sum of points for two best solutions.

Solutions and information about team members should be sent to [tournament@chem.spbu.ru](mailto:tournament@chem.spbu.ru).  
If you are planning to participate in the Tournament please pre-register on [www.en.scitourn.ru/reg](http://www.en.scitourn.ru/reg)