



## National Student Team Contest (first stage)

### Task 1. Nanopowder

The white powder A containing 9,66 wt.% of nitrogen can be prepared with high yield by Skraup reaction from 2-aminophenol. The reaction of A with lead acetate and sodium perchlorate in methanol gave the single crystals of B. The compound B has a molecular structure and consists of tetramers that form a supramolecular ensemble. Heating of B with potassium hydroxide solution gives a white precipitate C containing 28,16 % of K, 25,63 % of Cl and oxygen. From 12,7 g of B 2,77 g of C can be obtained.

IR ( $\text{cm}^{-1}$ ) selected bands of compound B: 725(s), 818(vs), 1102 (s), 1227(vs), 1316 (s), 1380 (s), 1493(s), 1561 (s), 3040 (w), 3423 (w)

Using ultrasonic irradiation the nanoscale B can be obtained.

1. What are the compounds A, B, C? **(6 points)**
2. What is formed after heating of B prepared by a traditional and ultrasonic methods? **(2 points)**
3. Make a sketch with crystal structure of B, using a schematic representation of A molecules. Note that one half of lead atoms in B has a  $[\text{O}_3\text{N}_2]$  environment, the other – a  $[\text{O}_4\text{N}]$  environment. **(2 points)**

**Total – 10 points**