

Additional Problems for SF4 for the 4th IYNT 2016

21. Oxygen

Using any chemicals of your choice, produce a flask of oxygen. Prove that the oxygen concentration in the flask is higher than in the ambient air and determine the concentration.

22. Glycerol and water

Determine experimentally how the viscosity of glycerol-water mixtures depends on the ratio of components. Use the tools and materials of your choice.

23. Colors of the rainbow

You are given aqueous solutions of potassium dichromate ($K_2Cr_2O_7$) and copper (II) sulfate ($CuSO_4$). By mixing these two solutions in any combination with colorless solutions of your choice, obtain as many test tubes showing distinctly different colors as possible.

24. Density

You are given a small irregularly shaped object. Determine experimentally its density.

25. Tuning fork

Determine the frequency of a tuning fork with one or several experimental methods.

26. Soap boat

Make a flat soap powered boat from paper or plastic. Investigate the parameters affecting the maximum speed of the boat.

Essential equipment for the problems is provided. Teams can use any own equipment. The organizers can further provide the following equipment: alcohol lamps, crystalline potassium permanganate ($KMnO_4$), test tubes with stopper and tubing, chemical flasks, lighters, chemical beakers, glycerol, water, metal balls: 5 mm, 10 mm, 15 mm, rulers 30 cm, plastic funnels 50 cm, test tubes, sulphuric acid (H_2SO_4), silver nitrate ($AgNO_3$), potassium hydroxide (KOH , solution or crystal), sodium hydroxide ($NaOH$, solution or crystal), potassium thiocyanate ($KSCN$), ammonium hydroxide (NH_4OH), colorless protein solution for the Biuret test, wooden objects, balances (to 200 – 300 g), tuning forks, carton 10x10 cm, potassium dichromate ($K_2Cr_2O_7$), copper (II) sulfate ($CuSO_4$), soap, scissors