

### The scenario

<b>Subject</b>	Identification of selected groups of organic compounds
<b>Length</b>	4,49 min.
<b>Main objectives</b>	Learning the reactions characteristic of phenols and proteins
<b>Detailed objectives</b>	Observation of changes occurring during the reaction Learning the methods of detecting proteins and phenols in unknown substances
<b>Structure and description of experiments:</b>	
<b>Introduction</b>	Description: Phenols are aromatic alcohols, i.e. compounds with an aromatic ring and a hydroxyl group attached to it. In the presence of iron(III) ions, they form colored hexaphenyliron(III) complexes, in which the metal atom is surrounded by six phenol molecules. Aliphatic alcohols do not form such connections, so this reaction can be used to distinguish aliphatic alcohols from aromatic alcohols - phenols. Copper(II) sulfate (VI) in the presence of sodium hydroxide forms copper(II) hydroxide visible as a flocculent blue precipitate. After adding the protein, the content of the tube turns purple. Copper binds to the peptide groups present in the protein. Free amino acids and simple peptides do not undergo this reaction, so they can be used to distinguish between complex polypeptides (proteins). This is the so-called biuret reaction and can be used to determine protein in the urine.
<b>Main subject</b>	Description: Complex reactions for the detection of groups of chemical compounds.
<b>Experiment</b>	<p><b>Equipment:</b> test tubes, Pasteur pipettes, water wash bottle.</p> <p><b>Reagents:</b> copper(II) sulfate(VI) aqueous solution, sodium hydroxide solution, iron(III) chloride aqueous solution, protein solution, phenol aqueous solution.</p> <p><b>Precautions:</b> work with gloves and protective glasses!</p> <p><b>Description:</b> To two test tubes, add successively 1 ml of phenol solution (tube I) and 2 ml of copper(II) sulphate(VI) solution (tube II). Then add a few drops of iron(III) chloride solution to test tube I. To test tube II, add about 2 ml of NaOH solution and 1 ml of protein solution. After completing the exercise, pour the solutions into the containers indicated by the teacher.</p> <p><b>Questions:</b></p> <ol style="list-style-type: none"> <li>1. Note down the changes taking place in each test tube</li> <li>2. What reaction takes place in test tube II?</li> </ol> <p><b>Conclusion:</b> The content of test tube I takes on a violet color. This proves the formation of a colored complex between phenol molecules and iron(III) ions.</p> <p>In test tube II, a light blue precipitate of copper(II) hydroxide turns the protein solution purple-blue. Copper, like other heavy metals, binds strongly to proteins, creating their denaturation. This phenomenon is the</p>



	<p>mechanism of heavy metal toxicity. This reaction can also be used for protein detection.</p>
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**Level:** Secondary School



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