The scenario

Subject	Displacement of metals from solutions of their salts
Length	8,24 min.
Main objectives	Learning the activity series of metal
Detailed objectives	Observation of changes occurring during the reaction Learning about the activity series of metals and the values of electrochemical potentials of metals Comparison of the chemical activity of different metals based on the electrochemical series Learning the equation notation of the reactions taking place
Structure and description of experiments:	
Introduction	The electrochemical series, otherwise known as the metal activity series or the voltage series, is a ranking of chemical elements with metallic properties, according to their standard potential. The reference point for the electrochemical series is the hydrogen electrode, whose standard potential is conventionally assumed to be zero. Based on the electrochemical series and standard potential values, the more active metal (lower potential) will displace (with some exceptions) the less active metal from its salt solution.
Main subject	Description: Learning about the electrochemical series and activity of metals on the example of the reaction of displacing metals from their salt solutions.
Experiment	**Equipment:** test tubes, watch glass, copper plate, steel nail, penny coin – with copper, tweezers, fine sandpaper, filter paper. **Reagents:** aqueous salt solutions: copper(II) sulfate(VI), silver nitrate(V), mercury nitrate(V). **Precautions:** work with heavy metal salts - toxic! Silver nitrate(V) solution - caustic. **Description**: Clean the copper plate and iron wire to a shine with fine-grained sandpaper. Place the metal samples thus cleaned carefully in the test tubes (so as not to damage the bottom of the test tube). Place a penny coin on the watch glass. Note the appearance of metals before adding salt solutions. Then add silver nitrate(V) solution to the test tube with copper, add copper(II) sulfate (VI) solution to the test tube with iron (so that the metals are half-covered) and a watch glass with a penny coin add several drops of nitrate solution(V) mercury, this time so that it completely covers the coin. Set the tubes and slide aside for about 10 minutes. After this time, check the appearance of individual solutions and compare them with the original solutions. Then pour the solutions into the waste, carefully transfer the metal samples with tweezers to a dry piece of tissue paper, and check their appearance. Leave the metal samples on the stand to dry.

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	Questions: 1. Note your observations of the changes taking place 2. Write down the equations of the reactions taking place in each test tube or indicate that the reaction does not take place 3. What practical significance can (and have) the reactions taking place in this exercise? **Summary**: Metals have different chemical properties and different reactivity. To determine which metal is more reactive, you need to know its electrochemical potentials, which can be read from the electrochemical series, where the metals are ranked from the most reactive (lowest standard potential) to the least reactive (highest/most positive standard potential). A silver precipitate of metallic silver precipitated on the copper plate and the solution took on a slightly blue color coming from copper(II) nitrate(V). Silver(I) ions underwent a reduction reaction, while copper underwent an oxidation reaction. $Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$ The iron wire was covered with a rusty coating of metallic copper, the copper(II) ions underwent a reduction reaction, while the iron underwent an oxidation reaction. $Fe + CuSO_4 \rightarrow Cu + FeSO_4$ The penny coin, consisting mainly of copper, was covered with a silver layer of metallic mercury (it changed its color from yellow to silver). Mercury(I) ions underwent a reduction reaction, while copper underwent an oxidation reaction. $Cu + 2HgNO_3 \rightarrow 2Hg + Cu(NO_3)_2$ **Level:** Primary school

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