The scenario

Subject	Amphotericity
Length	4,48 min.
Main objectives	Learning amphoteric compounds
Detailed objectives	Observation of changes occurring during the reaction Learning the properties of amphoteric compounds Learning the notation of reaction equation
Structure and description of experiments:	
Introduction	Description: Amphotericity is the ability of chemical compounds to react with both acids and hydroxides, i.e. these compounds act as an acid in some reactions or a hydroxide in others. Amphoteric compounds do not react with water. Elements forming amphoteric compounds (oxides, hydroxides) have medium electronegativity and are found in the middle part of the periodic table, e.g. Zn, Al., Sn, Pb, As, Mn, Cr.
Main subject	Description: Learning amphoteric compounds and their properties
Experiment	**Equipment**: test tubes, Pasteur pipettes **Reagents**: aqueous solution of zinc nitrate(V), 5 M NaOH solution, 10% HCl solution **Precautions**: Caustic NaOH and HCl solutions - work with gloves and protective glasses! **Description**: Using a Pasteur pipette, pour about 2 ml of zinc nitrate(V) solution into two test tubes placed in a stand. Then, using a Pasteur pipette, add approximately 1 ml of 5 M NaOH solution to both test tubes, observing the appearance of zinc hydroxides. Then, add another portion of NaOH solution (minimum 2 ml) to the first test tube, and then drop about 2 ml of 10% hydrochloric acid solution to the second test tube. After noting down the observations, pour the contents of the tubes into the container indicated by the teacher, wash the tubes, and leave them to dry. **Questions:** 1. Write down the reaction equations (in full form) that take place in the test tubes after adding the first portion of NaOH. 2. Write down the reaction equation (in full form) that takes place in the test tube after adding the acid. 3. Write down the reaction equation (in full form) that takes place in the test tube after adding the second portion of NaOH. **Conclusions**: Związki amfoteryczne w zależności od środowiska reakcji — kwasowego lub zasadowego — mogą zachowywać się jak zasada lub jak kwas. W reakcji azotanu(V) cynku z wodorotlenkiem sodu powstaje galaretowaty biały osad wodorotlenku cynku o charakterze amfoterycznym. $Zn(NO_3)_2 + 2NaOH \rightarrow Zn(OH)_2\downarrow + 2NaNO_3$ After adding acid and excess hydroxide to the resulting zinc hydroxide, the precipitate in both tubes dissolved.

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	Zinc hydroxide in hydrochloric acid solution behaves as a base and forms a salt: $Zn(OH)_2\downarrow + 2HCl \rightarrow ZnCl_2 + 2H_2O$ However, in sodium hydroxide solution, it behaves like an acid and forms a salt-sodium zincate(II): $Zn(OH)_2\downarrow + 2NaOH \rightarrow Na_2ZnO_2 + 2H_2O$ or the coordination compound sodium tetrahydroxozincnate(II). $Zn(OH)_2\downarrow + 2NaOH \rightarrow Na_2[Zn(OH)_4]$ Amphoteric oxides and hydroxides include: Al_2O_3, ZnO, BeO, Cr_2O_3, MnO_2, As_2O_3, PbO, PbO_2, CuO, Cu_2O, FeO, Fe_2O_3, SnO_2, $Zn(OH)_2$, $Be(OH)_2$, $Cu(OH)_2$, $Pb(OH)_2$, $Fe(OH)_2$, $Sn(OH)_2$, $Al(OH)_3$, $Fe(OH)_3$, $Sn(OH)_4$. **Level**: Primary school

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