Understanding Exothermic Reactions and Atmospheric Pressure

Experiment Objective:
To observe the heat energy released as a result of the mixing of chemical substances and the changes in atmospheric pressure, aiming to enhance the understanding of these concepts.

Materials:
• 11 grams of copper rod
• 100 ml of Nitric acid
• 1000 ml balloon flask
• 1000 ml glass beaker
• Tubing for the balloon flask's air outlet

Experiment Procedure:
• Place 11 grams of copper rod inside the balloon flask.
• Fill the beaker with cold water.
• Add 100 ml of nitric acid to the balloon flask.
• Seal the balloon flask's opening with the stoppered hose.
• Insert the hose's end into the beaker.

• Nitric acid acts on copper, producing copper nitrate gas. Simultaneously, being an exothermic reaction, it releases heat, which is observable. The increase in temperature inside the flask will also raise the pressure. As the pressure increases, copper nitrate gas will be released through the outlet hose, mixing with air. To ensure safety, conduct the experiment inside an extraction hood.

• When all the copper in the nitric acid is consumed, the reaction will stop. Heat release will cease, and the experiment flask will start to cool down. As the temperature decreases, the air pressure inside will also drop.

• The open end of the release hose submerged in water will create a vacuum, gradually pulling water into the balloon flask. Initially, the cooling will be slow, but as water enters the flask, the cooling process will accelerate.

• The vacuum effect will continue until the pressure inside the balloon flask equals the external pressure. Subsequently, the vacuum will cease.
In this experiment, we observed chemical mixtures creating heat-releasing reactions and altering

atmospheric pressure