Standards:

HS-PS1-6. Define the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

Introduction:

This experiment is a bright and colorful way to demonstrate the properties of an oxidation-reduction reaction. When a tiny amount of potassium permanganate reacts with sugar and sodium hydroxide (commonly used for soap making), multiple reactions occur within a minute. The rapid chemical reactions create vibrant colors that can be observed by students. The following reactions are taking place:

\[
\begin{align*}
\text{MnO}_4^- (aq) + e^- &\rightarrow \text{MnO}_4^{2-}(aq) \\
\text{MnO}_4^{2-}(aq) + 2H_2O(l) + 2e^- &\rightarrow \text{MnO}_2(aq) + 4OH^-(aq)
\end{align*}
\]

Materials:

- 6 mg Potassium permanganate (KMnO₄)
- 750 mL Deionized water
- 6 g Sugar
- 10 g Sodium Hydroxide (NaOH)
- 1 L Erlenmeyer flask
- Magnetic stir bar
- Hot plate with stirring feature
Safety:
- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments.
- Potassium permanganate is highly reactive with alcohols and glycerol, so do not add it to those substances.
- Potassium permanganate is deep purple in color, and can stain clothes or skin.

Procedure:
1. In a 1 L Erlenmeyer flask, add 750 mL deionized water, as well as a magnetic stir bar.
2. Place the flask on the hot plate (you do not need to heat the flask) and turn the magnetic stirring function on.
3. While the water is stirring, add 6.0 g sugar and 10.0 g sodium hydroxide to the flask.
4. Once the sugar and sodium hydroxide is dissolved, add in the potassium permanganate.

Data and Observations:
Record your observations in this space

Questions:
1. What is an oxidation-reduction reaction?

2. What compounds were causing the visible colors in the reaction flask?

References: