**Honors Chemistry PBL: Saponification and Extraction of Essential Oils**

**Ask Question:** How can I extract essential oils from plants in the STEM garden and use these in conjunction with saponification to make aromatic soaps.

**Background**: Saponification is a process in which a fat molecule is broken down by sodium hydroxide (lye) into four smaller molecules; three of the new molecules are soap and one is glycerol. In simple terms saponification is the name for a chemical reaction between an acid and a base to form a salt. An acid is a molecule or ion that donates protons or hydrogen ions (H+) and/or accepts electrons, and a base is any substance that donates electrons or hydroxide ions (OH-) and/or that accepts protons. When you make soap, you mix an oil or fat (which is your acid) with sodium hydroxide or lye, which is your base to form soap (i.e., a salt). There are many different types of acids that will react with your base and saponify. Your acid could be olive oil, coconut oil or vegetable oil just to name a few. Each acid has a unique combination of triglycerides (compounds made of three fatty acids attached to a single glycerol molecule) which combines with the base (sodium hydroxide or lye) differently.

**Research**: Design an experiment to collect data and evidence for the extraction of essentials oils from plants we will harvest from our STEM garden. Once extracted you will need to conduct additional research on the methodology for the saponification process you will employ to chemically synthesize the aromatic soap.

**Make a Claim(s)**: Write a claim based on the evidence you collected for both parts of the investigation. Please explicitly address the question.

**Summary**: Write your conclusion and research summary to explain how your claim(s) is justified. Summarize your data, conclusions, and any modifications you would make to future investigations. Your conclusion should show how or why the data are relevant and support the claim. You should justify why the evidence is important to the claim. Your conclusion should always indicate the relationship to one or more scientific or math principles (i.e., Georgia Standards of Excellence).

**Honors Chemistry PBL: Saponification and Extraction of Essential Oils**

**Ask Question:** How can I extract essential oils from plants in the STEM garden and use these in conjunction with saponification to make aromatic soaps.

**Background**: Saponification is a process in which a fat molecule is broken down by sodium hydroxide (lye) into four smaller molecules; three of the new molecules are soap and one is glycerol. In simple terms saponification is the name for a chemical reaction between an acid and a base to form a salt. An acid is a molecule or ion that donates protons or hydrogen ions (H+) and/or accepts electrons, and a base is any substance that donates electrons or hydroxide ions (OH-) and/or that accepts protons. When you make soap, you mix an oil or fat (which is your acid) with sodium hydroxide or lye, which is your base to form soap (i.e., a salt). There are many different types of acids that will react with your base and saponify. Your acid could be olive oil, coconut oil or vegetable oil just to name a few. Each acid has a unique combination of triglycerides (compounds made of three fatty acids attached to a single glycerol molecule) which combines with the base (sodium hydroxide or lye) differently.

**Research**: Design an experiment to collect data and evidence for the extraction of essentials oils from plants we will harvest from our STEM garden. Once extracted you will need to conduct additional research on the methodology for the saponification process you will employ to chemically synthesize the aromatic soap.

**Make a Claim(s)**: Write a claim based on the evidence you collected for both parts of the investigation. Please explicitly address the question.

**Summary**: Write your conclusion and research summary to explain how your claim(s) is justified. Summarize your data, conclusions, and any modifications you would make to future investigations. Your conclusion should show how or why the data are relevant and support the claim. You should justify why the evidence is important to the claim. Your conclusion should always indicate the relationship to one or more scientific or math principles (i.e., Georgia Standards of Excellence).