GOVT DEGREE COLLEGE, PUTTUR

QUALITY EDUCATION IS A GREAT TREASURE

BEST PRACTICE-II

2024-25

soap preparation

INTERNAL QUALITY ASSURANCE CELL

IN COLLABORATION WITH DEPT. OF CHEMISTRY

BEST PRACTICE -II

Title of the Practice: Soap Preparation

1. Objectives of the Practice:

- To provide hands-on training in the preparation of soap using eco-friendly ingredients.
- To develop entrepreneurial skills among students through the production and sale of handmade soaps.
- To promote sustainable practices by minimizing the use of chemical detergents.
- To instill scientific knowledge of saponification and related chemical processes.
- To encourage self-reliance and financial independence among students.

2. The Context:

Soap preparation is an essential chemical process that integrates theoretical and practical aspects of chemistry and environmental science. With growing concerns over the environmental impact of commercial detergents, there is a need to promote eco-friendly alternatives. This initiative allows students to apply their classroom knowledge in a real-world setting while also creating a source of income. The project not only supports skill development but also provides an opportunity for students to contribute to sustainable living practices.

3. The Practice:

- Students are trained in the scientific process of saponification using safe and natural ingredients like coconut oil, castor oil, and sodium hydroxide.
- The preparation involves heating the oil, adding an alkaline solution, and facilitating the chemical reaction to form soap.
- After completion of the reaction, the soap is solidified using a salt solution, cooled, and filtered.
- The prepared soaps are then cut, dried, and packaged for sale.
- The final products are sold to faculty members and students at affordable prices, making them both accessible and sustainable.

4. Evidence of Success:

- The prepared soaps were successfully sold to faculty members and students, generating revenue.
- Students gained practical exposure to chemical processes, entrepreneurship, and sustainable product development.
- The initiative received positive feedback from buyers for the quality and eco-friendliness of the soaps.

- The income generated was reinvested into the project, ensuring its sustainability and growth.

5. Problems Encountered and Resources Required:

Problems Encountered:

- Handling of caustic materials like sodium hydroxide required strict safety measures.
- Ensuring uniform quality and texture of the soaps during preparation.
- Initial reluctance among students due to unfamiliarity with the process.

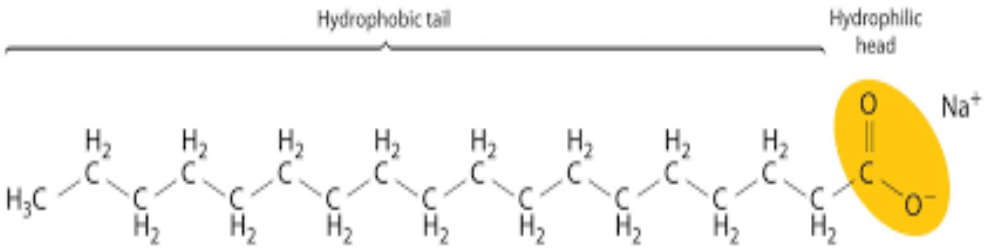
Resources Required:

- **Raw materials:** Coconut oil, castor oil, sodium hydroxide, ethanol, sodium chloride, and water.
- **Equipment:** Heating plates, glass beakers, measuring scales, filtration apparatus, and molds.
- **Safety gear:** Gloves, goggles, and aprons for safe handling of chemicals.
- **Packaging materials** for the final product.

Detailed note on preparation:

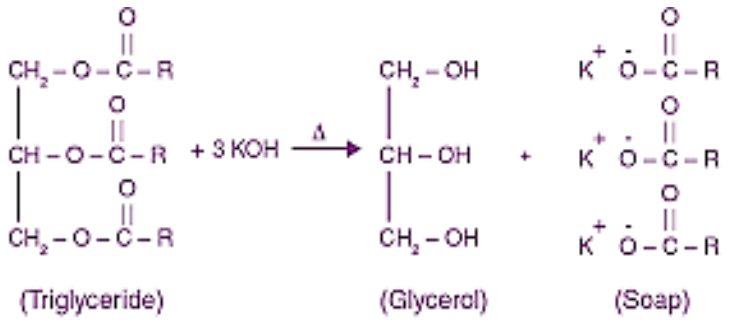
Introduction

Soaps are the sodium and potassium salts of long chain fatty acids that are generally made by saponification (alkaline hydrolysis) of natural fats, such as animal fats or palm oil. Prior to World War II, most soap was prepared in the home by boiling animal fat with lye (commercial sodium hydroxide). Soap is not particularly good for cleaning in hard water (water with high concentrations of Ca2+, Mg2+ and/or Fe3+ ions) because it forms insoluble complexes with divalent (or trivalent) cations. Organic sulfonic acid and phosphoric acid salts, commonly known as detergents, were found to be much more effective cleaning agents because they do not readily form insoluble complexes with the ions in hard water. Modern cleansers labeled "soft soap" are, in fact, detergents rather than soap. Check the labels for ingredients of some cleansers you have around the home, including shampoo. The phosphate detergents caused environmental problems in waterways, not because they are toxic, but because they are nutrients and resulted in an overabundance of plant growth, or algal blooms. Consequently, phosphate detergents have been replaced with other alternatives. Today there are a wide variety of synthetic detergents available for various purposes. Some representative detergents and a soap are shown below.



Materials and Reagents:

Shortening, lard or castor oil or coconut oil, 30% sodium hydroxide solution, 95% ethanol, ice, universal pH paper or red litmus paper, 1 % sodium lauryl sulfate (detergent) solution, 5% calcium chloride solution, filter paper, filtration apparatus, dirty pump oil.



Procedure for preparation of soap.

1. Add about 150 mL water to a 400 mL beaker and heat the water on a hot plate to about 85^0C. You will need to mount a clamp above the beaker to hold the Erlenmeyer flask/Beaker upright in the water bath.
2. Add about 1 g (approx. half a level, not heaping teaspoon) of shortening, coconut oil, or lard to a small beaker and dissolve it in 20 mL of 95% ethanol. Do not use too much fat or you will need more ethanol to dissolve it. Warm the ethanol and fat on the hotplate to get the fat to dissolve more easily. Do not allow the ethanol to boil
3. Note: SODIUM HYDROXIDE SOLUTION IS VERY CAUSTIC. AVOID GETTING IT ON YOUR SKIN OR CLOTHING. WASH IT OFF IMMEDIATELY WITH PLENTY OF WATER.
4. When the fat is completely dissolved, pour the solution into a 125 mL Erlenmeyer flask and add 10 mL of 30% NaOH solution. Swirl the flask to mix the solution and add a few (3 to 5) boiling chips to the flask.
5. Place the flask containing the fat solution in the water bath and fasten it with a clamp to hold it upright in the water bath. Place a ceramic crucible over the mouth of the flask to minimize evaporation of the alcohol. Place an ice cube in the crucible to more effectively condense the alcohol.
6. Allow the fat-alcoholic NaOH solution to boil for at least 30 min. [Note: do not boil the water in the water bath]. If you observe undissolved fat in the flask, add a little more ethanol to the flask and stir to dissolve the fat. Do not allow the hot water bath to get too hot, keep it just hot enough to have controlled boiling of the fat solution.

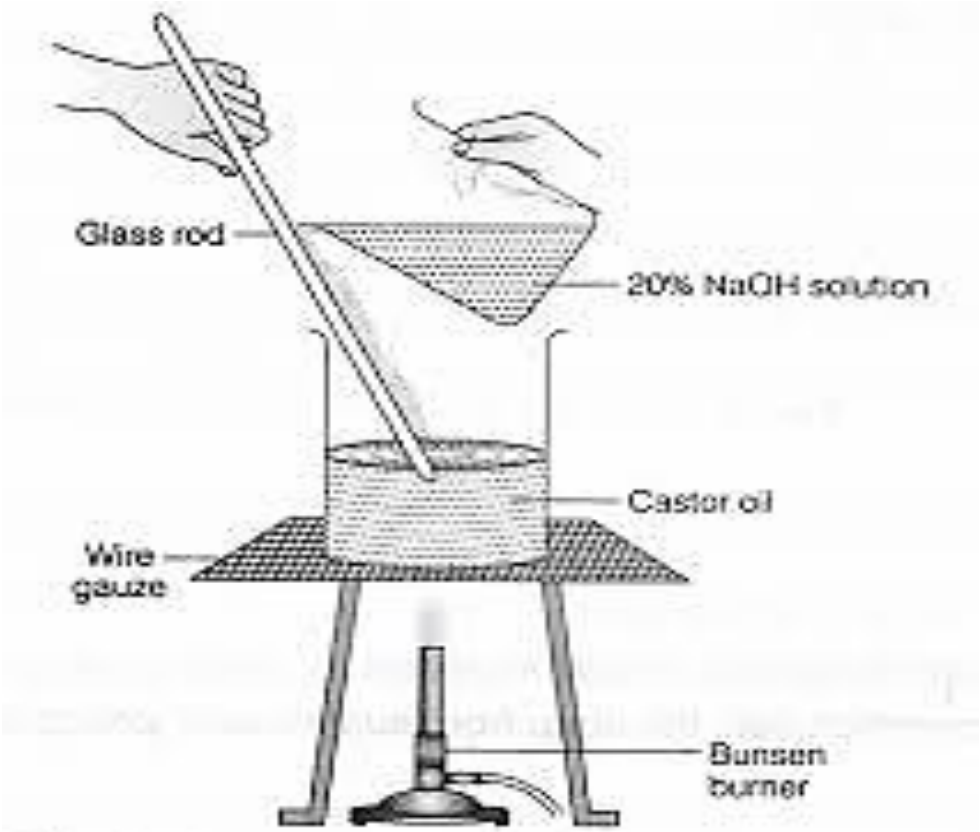
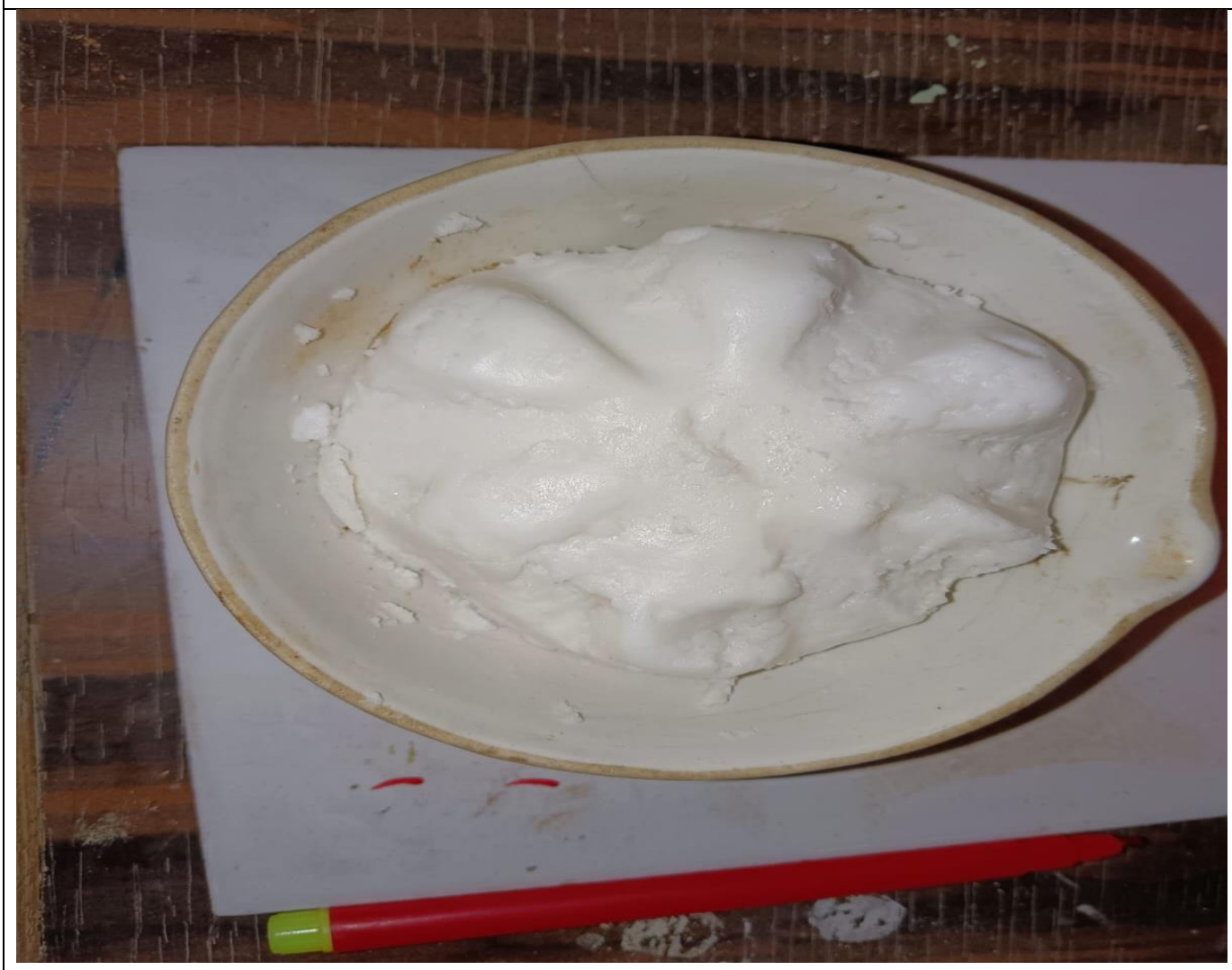


Fig. 1 Mixture of castor oil and NaOH solution

7. While the saponification proceeds, prepare a salt solution by completely dissolving 12 g sodium chloride (NaCl) in 60 mL deionized water in a 250 mL beaker. After the salt completely dissolves, transfer about half of this salt solution to another beaker and place both beakers of salt solution on ice to cool them.
8. After 30 min, test the fat solution to see if saponification is complete by placing a few drops of the solution in a test tube of deionized water. If you see fat droplets float to the top, the saponification is not complete and allow it to boil for an additional 10 min.
9. When saponification is complete, carefully pour the hot reaction mixture into one beaker of salt solution and stir for a minute or two. Place the mixture on ice to cool it before filtering. The soap should solidify before filtering this mixture.
10. Set up a suction filtration apparatus with a Buchner funnel and filter paper (see Appendix I for a diagram of the vacuum filtration apparatus). Filter the mixture from step 8, and wash the soap (remaining in the Buchner funnel) twice with ice cold salt water (from the second beaker). Draw air through the soap for a few minutes to remove most of the water.

Soap is the combination of potassium and sodium salts with the fatty acids. Due to foam forming property it very important in day-to-day life. Now a days soap is very important part of the life. Soaps are used for the various purposes like cleaning, disinfection and various use in domestic purpose. Soaps are mainly soluble in water. The range of TFM (Total fatty matter) in the soap is in between 50% to 90 %.

First year B.Sc. Second semester students Preparing Soap in chemistry Laboratory



Prepared soap in various molds

Conclusion:

This initiative not only enhanced students' scientific and entrepreneurial skills but also promoted self-sufficiency and sustainable practices. By engaging in the production and sale of handmade soaps, students learned the value of skill-based education and financial independence, making this a highly beneficial best practice in the institution.

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