

Soaps and Detergents

Questions

1. The soap and detergent industry is a large component of our North American economy.
 - a. Describe how soaps are made.
 - b. Describe the molecular structure and physical properties of soaps and how these account for cleansing action.
 - c. Comment on environmental concerns raised by the enormous use of these products.
2. Products such as the molecule $C_6H_5SO_2O^{-1}Na^{+}$ are extremely useful as detergents.
 - a. What advantages do these substances have over soap?
 - b. How do the hydrocarbon "tails" of biodegradable and non-biodegradable detergents differ?

Answers

1.

a.

The process is called saponification where fatty acids and strong bases are heated together to produce soap.

b.

Soaps are composed of two molecular structures, a hydrophilic end and a hydrophobic end. These hydrophobic ends embed in oil and/or dirt to form a micelle of colloidal size. The micelle is rinsed away with H_2O .

c.

Previously, the use of phosphates were nutrients for algae. However, today, detergents have a longer life and are therefore slow to biodegrade. The containers that the detergents are sold in is also contributes to our environmental problems.

2.

a.

Soaps are long chains of carboxylic acid (fatty acids) such as sodium stearate. These tend to be expensive because they are made from refined animal and vegetable fats, whereas soapless detergents are made from the byproducts of oil-refining and are therefore cheaper to manufacture.

b.

The hydrocarbon tails of early non-biodegradable detergents consisted of branched chain polypropenes which are resistant to bacterial attack. This caused damage to wildlife and gave rise to dirty foam in rivers and on seashores. Today, most detergents consist of hydrocarbon unbranched short tails which are easily broken down by bacteria. These biodegradable detergents do not contribute to the creation of foam in our waterways.