

Answers will vary, but the detergent should perform better.

3. Compare the solubilities of soap and detergent in the presence of salts by filling in the following chart.

	Soap	Detergent
CaCl ₂		
MgCl ₂		
FeCl ₃		

4. Was the fatty acid produced by the reaction of acid and soap soluble in the water?

no

5. Was the sulfonic acid formed from the detergent soluble in water?

yes

Analysis

1. Which had the better cleaning action — the soap or the detergent?

the detergent

2. Using the information in the Concepts section, explain the results in the Data section, step 3.

The detergent does not form insoluble salts in hard water (water with dissolved iron, calcium, or magnesium salts); it has a higher solubility.

3. In conclusion, what advantages do you think detergents have over soaps?

Detergents dissolve better and do not precipitate in either hard or acidic water; therefore, they clean better under all conditions.

4. A mole of fat has a gram-molecular mass of about 900 g, and a mole of NaOH has a gram-molecular mass of 40 g. Which reactant was in excess in the reaction you carried out in step A1 of the Procedure section? The following steps will help you. You should first calculate the number of moles of fat and NaOH used in Procedure A1.

$$\frac{10 \text{ g fat}}{900 \text{ g fat}} \times \frac{1 \text{ mol fat}}{1} = \text{moles of fat}$$

$$\frac{15 \text{ mL}}{1000 \text{ mL}} \times \frac{6 \text{ mol NaOH}}{1} = \text{moles of NaOH}$$

Then you should compare the moles calculated to the mole-to-mole ration of the balanced equation in the Concepts section.

The NaOH is in the excess. (The calculated mole-to-mole ratio is 0.01 mol fat:0.09 mol NaOH. The theoretical ratio is 1 mol fat:3 mol NaOH. Therefore, three times more NaOH was used than was necessary.)