Try This at Home Science:
DIY Hand Sanitizer

Activity Overview:
Learn how to make a homemade hand sanitizer based on CDC recommendations for sanitizer efficiency and safety.

Materials:
- 91% isopropyl alcohol
- Aloe Vera gel
- Lemon juice or essential oil (optional)
- 1/3 cup measuring cup (for 60% sanitizer)
- 1/4 cup measuring cup (for 68% sanitizer)
- Bowl
- Wooden spoon or whisk
- Funnel
- Clean, empty container for storage

Safety Warning:
Alcohol-based sanitizers are not a substitute for hand washing with soap and water. Homemade sanitizers should only be considered when manufactured products are unavailable in stores. Be careful to follow recipes exactly and use clean materials when making homemade products to ensure safety and efficiency.

Preparation
1. Wash hands with soap and water for at least 20 seconds before beginning procedure.
2. Wash and dry all materials completely before preparing sanitizer, including the empty container that will be used for sanitizer storage.

60% Alcohol Sanitizer Procedure
1. Measure 1/3 cup Aloe Vera gel and pour into bowl.
2. Measure 2/3 cup 91% isopropyl alcohol, and pour into bowl.
3. Add 3-5 drops of essential oil or lemon juice (optional).
4. Mix completely with spoon or whisk.
5. Once thoroughly mixed, transfer the mixture to the clean, empty bottle using the funnel. Avoid touching the mixture while adding it to the container to avoid contamination of your sanitizer.
6. Secure the cap on the bottle, and shake before use.
7. Use your 60.6% hand sanitizer solution after touching surfaces such as doors and grocery carts, and even to clean your credit cards.

68% Alcohol Sanitizer Procedure

3. Measure 1/4 cup Aloe Vera gel and pour into bowl.
4. Measure 3/4 cup 90% isopropyl alcohol, and pour into bowl.
5. Add 3-5 drops of essential oil or lemon juice (optional).
6. Mix completely with spoon or whisk.
7. Once thoroughly mixed, transfer the mixture to the clean, empty bottle using the funnel. Avoid touching the mixture while adding it to the container to avoid contamination of your sanitizer.
8. Secure the cap on the bottle, and shake before use.

What's happening?

We made hand sanitizer! Alcohol-based sanitizers are effective at destroying most viruses and bacteria due to the chemical structure of alcohol and its ability to break apart cell membranes. Most cells, including viruses and bacteria, have a lipid bi-layer membrane containing hydrophilic (water loving) and hydrophobic (scared of water) sides. Since alcohol has a similar structure, it can enter the lipid bi-layer and break it down. Alcohol is able to *denature* or breakdown cells when it interacts with the cell membranes.

Once the lipid bi-layer has been broken down the contents of the cell spill out and can no longer function properly, basically killing the cell. This is a wonderful interaction to happen between hand sanitizer and germ cells, but is still no substitute for soap and water. When using hand sanitizer, you should use at least one full squirt and rub your hands until they are completely dry to maximize the effectiveness. Make sure to wash your hands with soap and water at your next opportunity for at least 20 seconds.

How effective is hand sanitizer?

When we add any liquid to the isopropyl alcohol we dilute, or thin, the concentration of alcohol in the solution. This means that when we increase the overall volume, the total amount of isopropyl alcohol stays the same but the concentration becomes lower. For example, two drops of food coloring in an empty glass is extremely concentrated and appears dark in color. As soon as water is added to the glass, the color starts to become paler and more translucent (easier to see through).

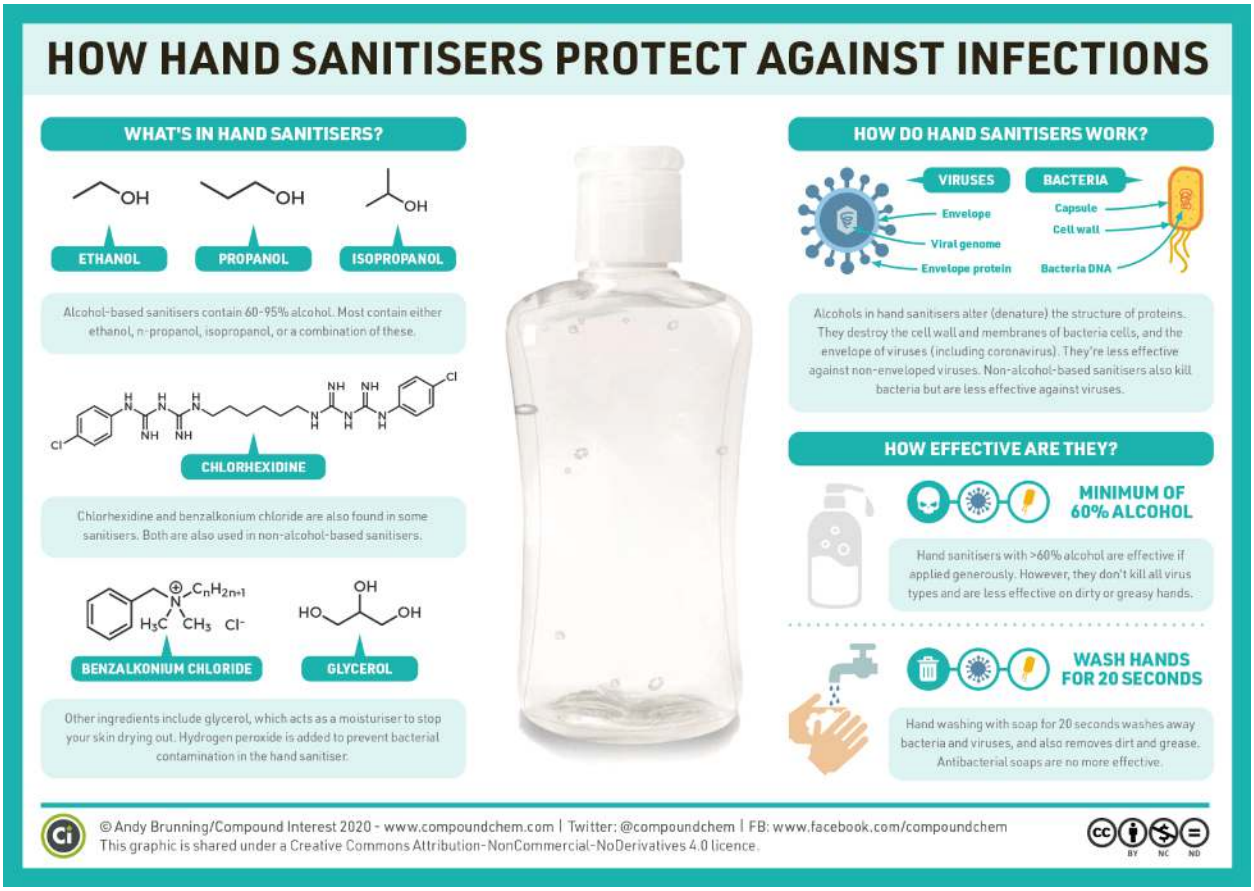
Even though the amount of food coloring in the glass is unchanged, the concentration is much less after adding water. Aloe Vera is added to this hand sanitizer recipe as a moisturizer, to prevent the alcohol from drying your hands. However, it is important to follow the recipe exactly, to ensure the final concentration of isopropyl alcohol is at least 60% to adhere to CDC recommendations for sanitizer effectiveness.

What if these ingredients are not available?

- Substitute the Aloe Vera gel for glycerol, which can be purchased online.
- If isopropyl alcohol is unavailable, a concentrated grain alcohol (ethanol) can be substituted. Adjust the ratios of alcohol to Aloe Vera gel to ensure the final concentration of alcohol in the sanitizer is at least 60%

Additional Information

ECHO Live! (Episode 39): The Science of Sanitizer



CDC Hand Hygiene Recommendations
https://www.cdc.gov/coronavirus/2019-ncov/hcp/hand-hygiene.html