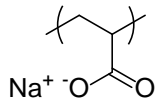


## Pre-lab Answers

### 1. What is sodium polyacrylate?

Sodium polyacrylate is a water soluble polymer. The chemical structure of the polymer is shown below. The basic polymer is poly(acrylic acid), which has a carboxylic acid group on each repeat unit. In sodium polyacrylate, the carboxylic acid groups are neutralized with a sodium counter-ion.



### 2. What is the difference between hydrophilic and hydrophobic? Which part of a diaper is hydrophobic?

Hydro mean water. Philic mean loving, so hydrophilic is water loving.

Phobic means hating, so hydrophobic is water hating.

The outside portion of a diaper is hydrophobic, so it will not leak when full of water.

### 3. What is a super absorbent polymer?

A super absorbent polymer is a polymer that can absorb many times its weight of liquid. Typically superabsorbent polymers absorb water.

### 4. What is found in the normal contents of urine and what is the pH level?

Urine is primarily composed of water (95%) and urea. Dissolved salts, such as sodium chloride and potassium chloride are typically present. Normal urine should have a pH of

### 5. Compare the chemical structure and polarity of sodium polyacrylate and water? How does sodium polyacrylate interact with water?

Sodium polyacrylate is soluble in water. Crosslinked sodium polyacrylate, such as found in diapers will swell in water. This is driven by the dissociation of the sodium carboxylate salt in the water and the hydrogen bonding interactions between the water and the polymer.

6. How much waste is created by disposable diapers each year in the United States?

According to the Real Diaper Association

(<http://www.realdiaperassociation.org/diaperfacts.php>) 27.4 billion disposable diapers are used in the US each year.

### Experiment Guide

The general idea of this experiment is to compare how much water is absorbed by each type of diaper. A cost analysis can be done by normalizing the absorbance of each diaper (grams water/grams diaper) by the cost per gram of the diaper.

For the test it is important that each diaper sample is tested under the same conditions. This includes the size of the diaper sample, the time it is immersed in liquid, the composition of the aqueous solution, and the temperature of the aqueous solution.

The simplest test is to use tap water to swell each diaper. Students may try and model urine more accurately by preparing a salt water solution and heating the water. A sugar solution could be used to mimic a person with glycosuria, where the kidneys are not able to remove all of the sugar from the urine.