

Name \_\_\_\_\_

## Acids at Work: How Acids Are Used in Industry

### Open-Ended Response Answer Key

1. Improper waste treatment in industries can lead to soil and water contamination, harm to wildlife, and long-term ecosystem damage. The use of acids to neutralize hazardous waste materials can mitigate this impact by transforming harmful substances into less dangerous forms, making cleanup and recovery efforts more manageable.
2. In pharmaceutical manufacturing, one crucial process involving acids is the synthesis of active pharmaceutical ingredients. For example, aspirin is synthesized by reacting salicylic acid with acetic anhydride in the presence of a catalyst like sulfuric acid. This reaction produces acetylsalicylic acid, the active ingredient in aspirin. Acids are essential in controlling reaction conditions, ensuring the purity and effectiveness of the final product.
3. Citric acid enhances the flavor of various food and beverage products by providing a pleasant tartness and balancing sweetness. For instance, it gives lemonade its refreshing tang and enhances the taste of fruit-flavored candies.
4. Acetic acid, found in vinegar, acts as a natural preservative in the food industry by creating an acidic environment that inhibits the growth of spoilage microorganisms. This preservation method extends the shelf life of foods like pickles, sauerkraut, and salad dressings. Acetic acid is safe for consumption when used in proper concentrations.

