

# Chemistry in the Environment— Demonstration Summaries and Concepts



## ***Clearing Water with Alum—Water Purification***

Where does drinking water come from and how is it purified? Most of the suspended solids in water consist of small, dispersed particles that cannot be separated by filtration. In this demonstration, a commercial purification procedure for removing suspended solids from drinking water is introduced. Adding alum causes the colloidal particles to coagulate and “settle down.”

## ***Acid Rain in a Bag—Reaction of Nitrogen Oxides in the Atmosphere***

Perform a safe, microscale simulation of acid rain formation. A zippered bag on the overhead projector is a model atmosphere for the generation, dispersal, and reactions of nitrogen oxides with air and water. Observe a brown cloud of nitrogen dioxide safely contained within the bag, and follow the acid–base indicator color changes to see how acid rain is formed.

## ***Buffering of Lakes and Streams—Acid Neutralization in Nature***

An “acid rainfall” solution is poured through a column of marble chips to illustrate the formation of a buffer in lakes with a limestone bed. Observe the rainbow spectrum of color changes as acid rain containing universal indicator slowly filters through the calcium carbonate “rocks,” and then test the ability of the resulting “lake” or filtrate to neutralize additional acid rain.

## ***Oil Spill Cleanup—Detergents, Dispersants, and Polymers***

Model an oil spill and let students explore possible solutions to the problems that arise because oil and water do not mix. The demonstration includes the use of commercial polymer technology for cleaning up oil and fuel spills. The unique absorbent polymer bonds quickly and safely to liquid hydrocarbons, generating a solid waste product that separates from the water and is easily removed.



## ***Cleaning Up with Iron—Redox Reactions and Groundwater Remediation***

Permeable reactive barriers (PRBs) are walls built below ground to remove pollutants from contaminated groundwater. PRBs made of metallic iron are used to remove chlorinated organic compounds from groundwater. Iron is a good reducing agent—it reduces toxic organic compounds and converts them to less harmful substances. The reaction of iron powder with organic redox indicators demonstrates the “potential” of this method for cleaning up organic pollutants.

### **Concepts**

- Coagulation
- Flocculant
- Water purification
  
- Oxidation–reduction
- Acid–base indicators
- Acid rain
  
- Acid rain
- Acid–base indicators
- Buffers
  
- Oil spills
- Detergents and dispersants
- Absorbent polymers
  
- Groundwater remediation
- Permeable reactive barriers
- Oxidation–reduction