



Grade Level:
11th Grade

Subject:
Chemistry

Exhibit:
#14 Reclamation
(Ground Filter)

**Approximate
Time Frame:**
2 hours (more than one
class period)

Materials:

- paper
- pencil
- plastic water bottles or cups
- aquarium filter charcoal
- fine sand
- water
- food coloring
- vegetable oil
- sugar
- Benedict solution

Lesson Plan - Is it Clear Yet?



Science TEKS:

1. A Demonstrate safe practices during field and laboratory investigations.
1. B Make wise choices in the use and conservation of resources and the disposal or recycling of materials.
2. A Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
2. B Collect data and make measurements with precision.
2. C Express and manipulate chemical quantities using scientific conventions and mathematical procedures such as dimensional analysis, scientific notation, and significant figures.
2. D Organize, analyze, evaluate, make inferences, and predict trends from data.
2. E Communicate valid conclusions.
3. A Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information.
3. B Make responsible choices in selecting everyday products and services using scientific information.
3. C Evaluate the impact of research on scientific thought, society, and the environment.
3. D Describe connections between chemistry and future careers.
3. E Research and describe the history of chemistry and contributions of scientists.
4. A Differentiate between physical and chemical properties of matter.
4. C Investigate and identify properties of mixtures and pure substances.
5. A Identify changes in matter, determine the nature of the change, and examine the forms of energy involved
12. A Demonstrate and explain effects of temperature and the nature of solid solutes on the solubility of solids.
12. B Develop general rules for solubility through investigations with aqueous solutions.
12. C Evaluate the significance of water as a solvent in living organisms and in the environment.

14. C Identify the characteristics of a neutralization reaction.
14. D Describe effects of acids and bases on an ecological system.

Related TEKS: Physics, Chemistry and Biology

Vocabulary of Instruction:
water reclamation

Advanced Preparation: Organize students' into groups

Instructional Procedure (5 E)

Engage: The students will: Describe the biological processes involved in water reclamation and purification of wastewater.

Explore: For this lab you can use plastic water bottles or cups. Poke several holes in the bottom of the cup and put an inch or two of aquarium filter charcoal and cover with another inch or two of fine sand. It may help to rinse the charcoal and sand in another container or strainer prior to using. You have just completed your ground filter. A variety of solutions can be used to strain through the filter. Some of these are water with dirt stirred up in it, water with a light tint of food coloring, water with vegetable oil, and water with dissolved sugar. Let different groups try different solutions and report their findings back to the class. The dirty water, oil, and food coloring mixtures can be measured using before and after observations. You can even make ahead of time, different concentrations of food color and water to compare the before and after filtering solutions to determine a measurable change in the filtrate. The presence of dissolved sugar can be determined using a few drops of Benedict solution in the filtrate and heating it up in a hot water bath. If sugar is present the solution will turn orange.

Explain: One of the final steps in water reclamation is to filter the water through giant sand and charcoal filtering systems. The sand filters act to reduce the turbidity and make the water clear. The charcoal filter uses activated charcoal to absorb any left over trace contaminants and to improve the taste and color of the final product. This process simulates nature's way of cleaning and purifying water. Spring water is famous for its great taste because it naturally filters water through sand and rock which gives it its great taste. Even the best man made systems for creating better tasting water include sand and activated charcoal. This lab today will demonstrate the effectiveness of this natural filter.

Elaborate/Extend:

Questions:

How well did the natural filter work on each of the solutions?
Which solution came out the clearest?
Did the filter remove the dissolved sugar? Why or why not?
You can buy distilled water or mineral water from the store.
Which one do you think taste better? Why?

Evaluate: Closure of class will consist of student groups developing and presenting a statement about what they learned today and how it may change their ideas toward their water use and the use of reclaimed water in the city.



How
does a
water well
work?