Name: Date:

Lab: Water Filtration Lab Period:

**Water Filtration Lab**

Water covers two-thirds of the Earth's surface and makes up a high percentage of adult's bodies, including 75% of our brains! Each day we need to consume more than two liters of the stuff—through liquids we drink and foods we eat. Although there's plenty of H2O around, much of it is either inaccessible or inconsumable to humans. But with water treatment, we are able to purify water and get what we need.

In this lab, you and a partner will be constructing a water filtration device to purify dirty water.

**THIS WATER IS NOT SAFE TO DRINK** because we will not be disinfecting our filtered water.



#### What you need (per day):

* 1/2 L of swamp water (or tap water with mud or dirt added)
* 2 L soda pop bottle with its lid
* [1000 ml beaker](http://www.hometrainingtools.com/beaker-glass-1000-ml/p/CE-BEI1000/)
* 2 20 oz cups
* 1 tbsp[alum (aluminum potassium sulfate)](http://www.hometrainingtools.com/alum-100-g/p/CH-ALUM/)
* 2 c[fine sand](http://www.hometrainingtools.com/sand-fine-white-1-lb/p/GS-SANDFIN/)
* 1 c [coarse sand](http://www.hometrainingtools.com/sand-coarse-1-lb/p/GS-SANDCRS/)
* 1 c [small pebbles](http://www.hometrainingtools.com/pebbles-fine-gravel-1-lb/p/GS-PEBBLE/)
* 1 [filter paper](http://www.hometrainingtools.com/filter-paper-11-cm--10-pkg/p/CE-FILTPAP/) or coffee filter
* 1 [rubber band](http://www.hometrainingtools.com/rubber-bands-bag/p/GS-RUBBAND/)
* 1 large spoon for stirring
* [spoon](http://www.hometrainingtools.com/spatula-stainless-steel/p/CE-SPATULA/) for scooping the alum
* [stopwatch](http://www.hometrainingtools.com/stop-watch-digital-2-case/p/ME-STOPWAT/) or timer
* 1 c crushed coal
* 1 c fine coal

#### What you do: Day 1

1. Create swamp/mud water concoction.
2. Pour swamp/mud water concoction water in the 2-liter bottle with a lid. Notice how it looks and smells.

***What you do: Day 2***

1. Put the lid on the bottle and shake vigorously for 30 seconds. Then pour the water back and forth between the two cups about 10 times.
2. Cut the 2L bottle in half.
3. Pour the water into the base of the bottle with its top cut off. Again notice how the water looks and smells.
4. Add 2 tablespoons of alum to the water in the bottle with the top cut off. Use the spoon to slowly stir the water for five minutes. What do you notice about the water as you stir it?
5. Now let the water sit undisturbed for 20 minutes, checking it every five minutes to note how it looks and smells (without moving it).
6. Use a rubber band to secure the filter paper to the mouth of the bottle with its bottom cut off. Put it upside down in the beaker.
7. Pour the pebbles into the bottle. Then pour the coarse sand on top of the pebbles and the fine sand on top of the coarse sand.
8. Carefully pour about one liter of clean tap water through, being careful not to disturb the top layer of sand. Pour the rinsed water out of the beaker.
9. Pour the top 2/3 of the swamp water through the filter, taking care to leave the sediment in the swamp water bottle.

***What you do: Day 3***

1. Repeat steps 1-8.
2. Pour the crushed coal into the bottle. Then pour the fine coal on top of the crushed coal.
3. Repeat steps 10-11.

#### What happened:

#### There are five steps to basic water purification: aeration, coagulation, sedimentation, filtration, and disinfection. Our project took us through the first four. ****Aeration**** adds air to the water. It allows gases trapped in the water to escape and adds oxygen to the water. ****Coagulation**** is the process which allows dirt and other suspended solid particles to chemically 'stick together'? into floc (clumps of alum and sediment). During this step, the water is also clarified, or made clear and colorless. ****Sedimentation**** is the process that occurs when gravity pulls the particles of floc to the bottom of the container. So as the water sits undisturbed, most of the floc settles, preparing the water for the next step. ****Filtration**** is the process where remaining solid particles and floc are separated and removed from the from the water. ****Disinfection**** is the final step, in which water is chemically treated to remove bacteria and other micro-organisms. These unseen bacteria can cause severe sickness and even death in humans.

***Because we didn't disinfect our water, it is NOT safe to drink.***

**Hypothesis: Will the Sand/Pebble filter or the Charcoal filter perform better? Why?**

**Data**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sand/Pebble Filter (Day 2)** | ****0 minutes**** | ****5 minutes**** | ****10 minutes**** | ****15 minutes**** | ****20 minutes**** |
| ****Looks**** |  |  |  |  |  |
| ****Smells**** |  |  |  |  |  |
| ****Color**** |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Charcoal Filter**  **(Day 3)** | ****0 minutes**** | ****5 minutes**** | ****10 minutes**** | ****15 minutes**** | ****20 minutes**** |
| ****Looks**** |  |  |  |  |  |
| ****Smells**** |  |  |  |  |  |
| ****Color**** |  |  |  |  |  |

**Describe the water that was filtered by the Sand/Pebble set up.**

**Describe the water that was filtered by the Charcoal set up.**

**Analysis**

**1)** Was your hypothesis correct? Which filtration system worked the best and why now do you think that?

2) Describe what is happening as the filtration systems purify the water.

3) How do these filtration systems mimic the traditional “high tech” and wetland filtration methods?

4) List 3 alternative ways you could improve the efficiency of the Sand/Pebble filtration setup.

5) Describe 2 sources of error that could have affected your results of this lab.

6) What else has to be done to your purified water in order to make it potable (drinkable)?