

Down To Earth: Mission Rehydrate

Make Your Dirty Water

Mix up a pitcher or jar of dirty water, enough for several tests (1 to 2 quarts).

1. Add 2 to 3 tablespoons of your chosen contaminants to clean water, then shake or stir. Keep adding your contaminants until the water looks cloudy. Record what contaminants you use and how much of the contaminants you use on your data sheet. **Shake or stir your dirty water again before every test.**
2. Pour some dirty water into a disposable cup, label it as “dirty water,” and set it aside for later. You will use it later to compare how clean the filtered water looks after it has drained through the different types of media.
3. Prepare a disposable measuring cup for your dirty water by writing measurements on a clear disposable cup with a permanent marker.
 - a. Pour $\frac{1}{4}$ cup of clean water into the disposable cup and mark the level.
 - b. Repeat with $\frac{1}{2}$ and $\frac{3}{4}$ cup of water.
 - c. Label the cup as “measuring cup” and set it aside.

NOTE: Do not use a measuring cup from your kitchen to measure the dirty water. This experiment could contaminate it.

4. When you want to filter the dirty water, pour some into your disposable measuring cup.

Contaminants Used	Amount of Contaminants Used

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Create A Color Comparison Chart

Create a color comparison chart to rate the water's clarity after it is filtered through each material. Use clean drinking water as the clearest sample and the dirty water you are testing as the darkest. Color each reference point along the scale with graphic software, photos of the actual test water, or a pencil or colored pencils. Then, decide how to label each (e.g., using numbers or descriptions). Below are some examples of color comparison charts, showing possible labels and drawings to indicate how clear or dirty the water appears.

Drinking Water	Clarity Level 1 • • • • • • •	Clarity Level 2 • • • • • • • • • • • •	Clarity Level 3 •••••••• •••••••• •••••••• ••••••••	Dirty Water
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Crystal Clear	Dingy	Cloudy	Muddy	Dark
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Now, make your own color comparison chart.

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Build Your Filter

Collect your disposable water bottle, fabric, rubber band, and scissors.

1. Cut the water bottle in half around the middle. You'll use the top half like a funnel. The bottom half will hold the filtered water.
2. Cover the mouth of the bottle (the spout) with gauze or other fabric. Hold it on tight with a rubber band or other closure.
3. Turn the funnel you made with the spout facing down and rest it inside the bottom half of the bottle. Your filter is now ready to use!

Test Your Filter

Now, you can start testing your filters and recording your data!

1. Choose **one type of filtering medium** (sand, gravel, cotton, etc.) and put some in the funnel. The amount depends on the size of your funnel. Leave at least an inch of space at the top so that you have room to pour in the dirty water without overflowing the funnel.
2. Using the disposable measuring cup you made, pour some dirty water into the funnel. The amount depends on how much water the bottom of your funnel can hold (keep the level of the filtered water in the bottom below the spout) and how much you can pour into the top of your funnel without overflowing. If the filter is draining slowly, only add a little dirty water at a time. Write the total amount of dirty water used on your data sheet. Return any leftover dirty water in your measuring cup to your pitcher or discard it.
3. Once you have poured the water into the filter, use your clock to record how long it takes for the water to start dripping out of the filter and how long it takes for most of the water to drain through. (Be aware that some filters may take less than a minute, and some may take several hours.) On your data sheet, record the time it takes for the water to pass through the filter.
4. What do you notice about how dirty water moves through the filter material? Record your observations on your data sheet.
5. After the water stops draining through the filter, pour the filtered water collected in the bottom of the filter into the disposable measuring cup. Record the amount of water that came through the filter.

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6. Pour the filtered water into its own clean cup and label it with the filtering medium you used. Compare it to the original clean water and your dirty water using the color comparison chart you made. Record the clarity on your data sheet.
 7. Repeat the process using a different kind of filter material. (If you are reusing your bottle, throw out the old filter material and rinse the bottle clean before adding the new filter material.)
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Multi-Layered Filter Media (Optional)

Now that you've tested several materials, think about how you might combine them to make them work even better:

- How would the properties of the different materials work together to remove more contaminants from the water?
- Do you think the order of the filter layers would affect the results? Why or why not?
- Could you adjust the layers to make the filter work faster? If so, how?

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Water Filter Observations

Reflection Questions

Do you think some filtering materials might work better with certain types of contaminants and not others? Why or why not?

Which kinds of material filtered the water the fastest? Which was the slowest?

Which filter material produced the clearest water?

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Type of Filter Material	Start Time	End Time	Total Time to Drain	Volume Added	Volume Collected	Color Comparison Clarity Rating