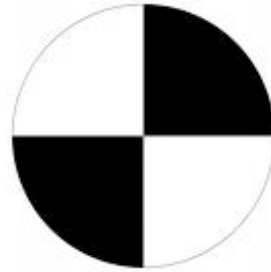


Instructions for the Transparency/Turbidity Station



History & Use:

The Secchi (pronounced 'sek-e') disk was invented by Italian Astronomer Pietro Angelo Secchi in the 1860s to measure how far a person could see down into the Mediterranean Sea. It is still used widely today, partly because it is such a simple tool. A Secchi disk is round, and is painted on top with a pattern like this:



The **weighted** disk is lowered slowly into a lake, river or ocean. The **line attached to the middle of the disk** is calibrated, or **marked out in measured units**. When the disk disappears from view, the depth (as measured on the line attached to the disk) is recorded. Then the disk is lowered a bit further, and slowly brought back up. The depth at which the disk reappears is recorded. The average of these two depths is used as the Secchi disk depth – the depth a person can see into the water, also known as transparency of the water.

Using a Secchi disk to track water transparency over time provides information about the physical, chemical and/or biological processes taking place in the water. By taking many measurements over a period of time scientists can study changes in the water, due to sediment run-off from land or increased phytoplankton populations.

Materials:

- Large containers with water (1000 mL beakers)
- Powdered milk
- Ruler (with centimeters)
- String
- White plastic lid from a yogurt, sour cream or similar container
- Permanent black marker
- Nail or sharp object to make a hole in the lid
- Pencil and datasheet
- Duct tape
- Nuts or washers to use as weights
- Measuring cups and spoons
- Calculator

Question(s) to Explore:

How do particulates in water influence the depth to which light can penetrate?

How is water transparency measured?

Read and Predict: Read through all of the instructions, and predict the amount of particulate that will be required for a Secchi disk depth of 2 cm. Record your prediction in your science notebook.

Instructions:

1. Design and construct a mini Secchi disk using the materials provided. See the **bold** clues in the paragraph above to help with your design.
 - Cut the plastic lid into a 2” circle.
 - Using a permanent black marker, create the pattern as illustrated above.
 - Punch a hole in the center of the lid, using a sharp object.
 - Thread a string through the hole.
 - Tie or duct tape weight under the lid. Use nuts, washers, or any heavy object as a weight.
 - Be sure you leave enough string on the top to lower your mini Secchi disk into the water.
 - Mark the string in measured units, every 2 centimeters.
2. You will measure the Secchi disk depth in clear water, and then add “particulates” (powdered milk) to the water in measured amounts. After each addition of particulates, you will measure the Secchi disk depth again.
3. Design a data collection sheet in your science journal to gather information at this station. Remember to carefully record each step in a format that is easy to follow and can be shared with others. Your data should include:
 - amount of water
 - amount of particulate added at each step
 - total concentration of particulate in grams/liter
 - depth at which the Secchi disk disappeared
 - depth at which the Secchi disk reappeared
 - the average of the two depths (Secchi disk depth)
4. Start with 1000 ml of clear water in the beaker. Will you be able to find a Secchi disk depth in your beaker, with clear water?
5. Dissolve 2 Tablespoons of powdered milk into the clear water. Write down your prediction, then record the depth at which the Secchi disk disappears, the depth at which it reappears, and the Secchi disk depth.
6. Repeat this process several times, increasing the amount of milk powder you dissolve into clear water each time. Remember to record all your predictions and results on your data collection sheet in your science notebook.

Analyze and Conclude. In your science notebook:

1. Summarize your findings (the results of your experiments).
2. If you were on a boat in the ocean using a Secchi disk, what would your data collection table look like? Are there some variables you would need to control if you were taking measurements over time?
3. How do you think *turbidity* (the cloudiness of the water) might affect:
 - The amount of light that will pass into the water column and be available for photosynthesis by marine or aquatic organisms?
 - The amount of zooplankton available as food for young salmon and other fish?
 - How fast salmon fry and smolt can grow and their size at migration from fresh water to the ocean?
4. Do you think that rapidly-melting glaciers are most likely to increase or reduce water transparency in glacial lakes and streams?