**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **Activity– Concentration and Dilution** |

Adapted from: <https://manoa.hawaii.edu/exploringourfluidearth/chemical/chemistry-and-seawater/elements-all-around/activity-concentration-and-dilution>

**Procedure**

*Safety Note: Use food-safe cups and spoons that have not been used with laboratory chemicals or biological substances.*

1. Mark and label the six identical cups.
   1. Label one of the cups #6.
   2. Use the measuring cup to measure and pour 100 mL of water into cup #6.
   3. Use the permanent marker or wax pencil to mark a line on cup #6 at the water level.
   4. Make a line at the same level on each of the remaining drinking cups.
   5. Label the remaining cups #1 through #5.
2. If you are measuring the powdered drink mix, use a balance and a dry spoon to measure 3.5 g of mix into the small paper cup. (Do not do this step if you are using premeasured packets of drink mix.)
3. Pour the powered drink mix into cup #1. Add water to the line and stir.
4. In your group, determine a way to express how much solute (powered drink mix) is in the total solution. Record your answer in Table 2.4.
   1. The powdered drink mix and water make a total of 100 mL.
   2. The dry drink mix is the solute; it was dissolved.
   3. The water is the solvent; it did the dissolving.
   4. The solute and solvent created a solution—a mixture where things are dissolved.
5. Dilute the solution from cup #1 in cup #2.
   1. Using the measuring spoon, measure 10 mL of the solution from cup #1 and pour into cup #2.
   2. Add water to the line of cup #2 and stir.
   3. You have now added 10 mL of solution from cup #1 and water to cup #2 to make a total of 100 mL of solution.
   4. In your group, determine a way to express how much solute is in the total solution and record your answer in Table 2.4.
6. Dilute the solution from cup #2 in cup #3.
   1. Using the measuring spoon, measure 10 mL of the solution from cup #2 and pour into cup #3.
   2. Add water to the line in cup #3 and stir.
   3. You have now added 10 mL of solution from cup #2 and water to cup #3 to make a total of 100mL of solution.
   4. In your group, determine a way to express how much solute is in the total solution and record your answer in Table 2.4.
7. Dilute the solution from cup #3 in cup #4.
   1. Using the measuring spoon, measure 10 mL of the solution from cup #3 and pour into cup #4.
   2. Add water to the line in cup #4 and stir.
   3. You have now added 10 mL of solution from cup #3 and water to cup #4 to make a total of 100 mL of solution.
   4. In your group determine a way to express how much solute is in the total solution and record your answer in Table 2.4.
8. Dilute the solution from cup #4 in cup #5.
   1. Using the measuring spoon, measure 10 mL of the solution from cup #4 and pour into cup #5.
   2. Add water to the line in cup #5 and stir
   3. You have now added 10 mL of solution from cup #4 and water to cup #5 to make a total of 100 mL of solution.
   4. In your group, determine a way to express how much solute is in the total solution and record your answer in Table 2.4.
9. Give a sample cup to each group member. Starting with cup #6 and working backwards to cup #1, do the following:
   1. Pour a small amount of solution into each group member’s cup.
   2. Use your senses to make observations about the liquid in the cup as instructed by your teacher, this includes noting how the liquid appears, smells, and tastes, To look at the appearance, or color, of the solutions, you can compare the color to paint swatches. Record your observations in Table 2.4.
   3. Pour the remaining solution into the waste cup, rinse your sample cup with some water, and pour the rinse water into the waste cup.
   4. Repeat for each cup, making sure you work backwards, from cup #6 to cup #1.
10. Compare the way your group expressed concentration to the way other groups expressed concentration. Did each group express concentration in the same way? How did each group come up with their system?

**Data Table:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cup Number** | **1** | **2** | **3** | **4** | **5** | **6** |
| **Solute (g)** |  |  |  |  |  |  |
| **Solvent (mL)** |  |  |  |  |  |  |
| **Concentration** |  |  |  |  |  |  |
| **Appearance** |  |  |  |  |  |  |
| **Smell** |  |  |  |  |  |  |
| **Taste** |  |  |  |  |  |  |

**Questions:**

1. In your own words, define concentration, solute, solvent, and solution. What is the solute and solvent in this activity?

1. How did you express how much solute was in each solution (concentration)? Explain your system.
2. Did you express concentration the same way for each cup? Why or why not?
3. How did the amount of solute affect what you observed about the solution in each cup?

1. Dilution means adding water to something so that the ratio of solute to solvent is less than in the original solution. Some people say, “Dilution is the solution to pollution.”
   1. Do you think this statement is true? Could you ever add enough water so that there would be no drink mix—that the water would be the same as in cup #6, pure water?
   2. Do you think you could ever add enough water to a pollutant to make it disappear completely? Why or why not?