SERIAL DILUTION ACTIVITY

During this activity you are going to perform a serial dilution using a solution of Congo Red (a natural stain). The Congo Red solution was created by adding 10 grams of Congo Red to 90 ml of water thus creating a one-part-per-ten solution of Congo Red. This is equivalent to 100,000 parts per million (ppm) because ten times 100,000 is equal to one million. It is also equal to 100,000,000 parts per billion (ppb) or 100,000,000,000 parts per trillion (ppt).

Obtain a well tray, a dropper, and squeeze bottle of the one-part-per-ten solution of Congo Red. Use tape to label wells 1-12. Put three or four drops of the Congo Red solution into well one. Put nine drops of water into each of the other wells.

Now take the dropper and carefully transfer one drop of the Congo Red solution from well one into well two. Use a new toothpick (not the tip of the dropper!) to stir up well two. Use the toothpick to smudge some of the liquid in well two into the circle on your results worksheet. Now you need to write some information down on your worksheet: What is the new ratio of Congo Red to water? (Remember, the ratio in the first well was 1:10), How many parts per million, billion, or trillion does this represent?

After you are done with these questions, carefully wash the glass dropper including the black rubber bulb at the top. Now transfer a drop from well two into well three. Answer the same questions for well three as you did for well two.

Continue the serial dilution all the way through to the last well ***making sure to carefully wash the dropper before making a transfer to the next well and using a new toothpick EACH TIME.***

When you are finished, thoroughly wash the dropper and its black, rubber bulb, and the well tray.

When you are done cleaning up and putting away the materials for this activity, please answer the questions on the <u>back</u> of your data worksheet.

1. What was the last well in which you could see any trace of the Congo Red dye?
2. Where there any Congo Red molecules in the last well?
3. Is there any way to prove your answer to question two?
4. From what you have learned in this activity, do you think it is possible that clean, clear drinking water could be contaminated with chemical toxins?
5. How effective do you think the human senses of smell, taste, and sight are at monitoring water quality?
6. One way of dealing with water contaminants is through dilution. As the saying goes "dilution is the solution to pollution." Do you think that dilution is an effective way of dealing with water pollution?
7. The state standard for mercury in drinking water is 5 ppb. My tap water tested at .002 ppm. Is it safe?
8. If ocean water has a 3.5 % concentration of salt, how many ppm is that?
9. (EXTRA CREDIT) How does this activity relate to the concept of the *nonthreshold dose-response model* versus the *threshold dose-response* model? (Remember that the *threshold dose-response* model says that a toxic chemical must reach a certain level before it starts to do any harm to an organism whereas the *nonthreshold dose-response* model says that harm begins with the first molecule of the substance in the organisms body)