Name _____   Date _____

The Marathon Battery Story
What does one part per million look like?

<u>Serial Dilution Activity</u>
        To help you visualize the scale of parts per million, you will dilute food coloring with water until you have a liquid that is one part per million food coloring. Note that 1 ppm = 1:1,000,000.

<u>Materials</u>: Spot plate with at least seven wells; dark food coloring, color pencil of the same color; water; dropper; grease pencil
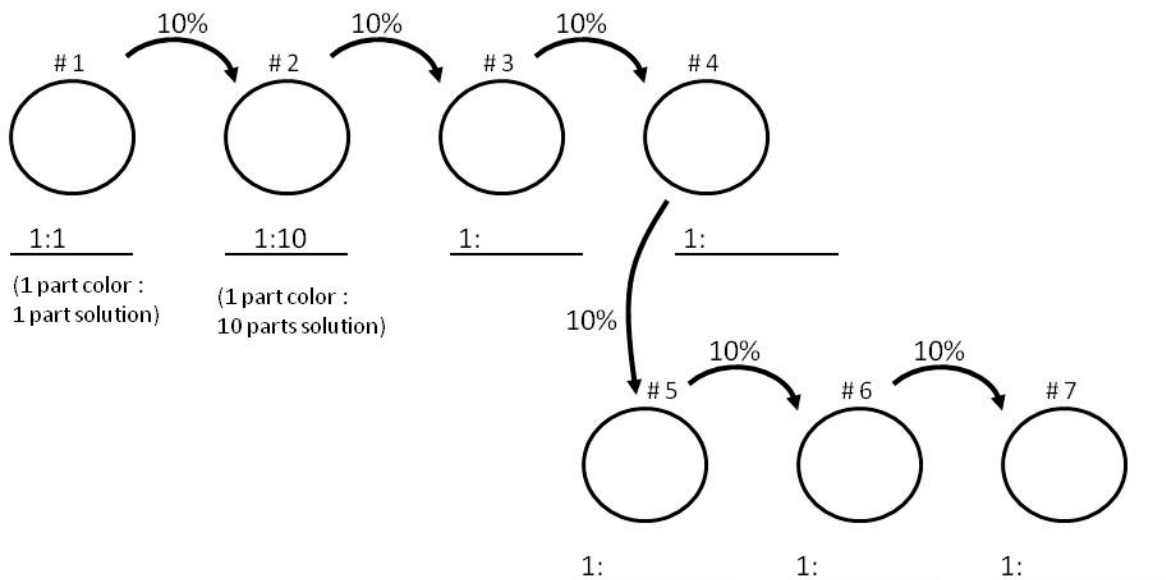
<u>Procedure:</u>
Set up the food coloring:
a) Label seven wells on your spot plate from #1 to #7 with the grease pencil.
b) Put 10 drops of food coloring in well #1.
c) Put 9 drops of water in each of the other wells, #2 – #7.
d) Color well #1 below to show 100% strength food coloring.

Conduct the serial dilutions:
e) To begin the serial dilutions, use the dropper to take one drop of food coloring from well #1 and add it to well #2. Stir gently. In #2, you now have a liquid is 10% food coloring. One way to represent this is to write the ratio 1:10, or one drop of food coloring to 10 drops of liquid. Color well #2 to show 10% food coloring.
f) Next use the dropper to put one drop from #2 (<u>not</u> from #1) into well #3. What percent of the solution is food coloring? _____ What is the ratio of food coloring to liquid in #3? _____ Record the ratio below and color well #3.
g) Continue the serial dilution in sequence, always adding one drop from the previous well, until you have added one drop of #6 to #7. Record the ratio of food coloring to liquid for each dilution and shade in the circle to match the color of the liquid in each well.

10%   10%   10%
1   # 2   # 3   # 4

1:1   1:10   1:_____   1:_____
(1 part color :   (1 part color :
1 part solution)   10 parts solution)

10%
                    10%   10%
              # 5   # 6   # 7

1:_____   1:_____   1:_____

1. Which well has one part per million of food coloring in the liquid? _____

2. Which well has 10 ppm? _____

3. Which well has 100 ppm? _____

4. Explain the meaning of one part per million.

_____
_____
_____
_____

5. The surface sediments in part of Foundry Cove were contaminated with 50,000 ppm of cadmium in 1975. Explain what this means.

_____
_____
_____
_____
_____
_____

Extension:

a. Write the ppm food coloring for each of the seven wells.

_____
_____

b. How many more test tubes would you need to continue the dilutions to get 1 ppb (part per billion)? Explain how you know.

_____
_____
_____
_____

c. How could you make 50,000 ppm food coloring? (50,000 ppm was the highest contamination shown on the maps in Lesson 1.) Describe the steps.

_____
_____
_____