Name ________________________ Date _________

How much turbidity is too much?

Before you begin: Develop a hypothesis that predicts at what concentration of turbidity you think an aquatic animal will begin to demonstrate a response.

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Materials:

- 7 pint jars per group
- Pond water (enough for 500 mL per jar)
- Liquid bentonite
- 1 mL eyedropper
- Turbidity meter
- Zooplankton (recommended: *Daphnia magna*)

Preparation:

a. Add 500 mL of pond water to each jar.

b. Measure out the required amount of bentonite (which simulates turbid water) using the eye dropper, and add to the jar with water. Stir the jar.

solution #	Amount of bentonite	Turbidity (NTUs) – *provided as a reference only; each experiment will be slightly different due to pond water differences*	YOUR turbidity values
1	0	6.6	
2	0.5 mL	57.1	
3	1 mL	81.3	
4	2 mL	108	
5	3 mL	164.6	
6	4 mL	240	
7	5 mL	670 (max of our probe)	

c. Add 5 young *Daphnia magna* to each jar. Make sure they don't have eggs.

d. At least once a day, cap the jars and shake them to stir up the bentonite. Monitor the animals over the next 3 days, checking at least once a day. Remove any dead animals as well as the molt castings from the container.

Data: Record the number of animals that are dead each day for the next 3 days.

DATA TABLE

Amount of bentonite	# dead after 1 hour	# dead after 24 hours	# dead after 48 hours	# dead after 72 hours	Average # dead
0					
0.5 mL					
1 mL					
2 mL					
3 mL					
4 mL					
5 mL					

Class Average: Compare your data with your classmates' data. How many organisms were dead after 3 days at each concentration?

	0	0.5 mL	1 mL	2 mL	3 mL	4 mL	5 mL
Group 1							
Group 2							
Group 3							
Group 4							
Group 5							
Group 6							
Group 7							
Group 8							
Average							

Make two graphs; one showing the change in survival over time, and a second showing the total number of surviving animals after 3 days, based on your class averages.

Analysis:

1. Looking at your individual group data, do you notice any trends?

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2. Looking at your individual group data, are there any data that don't make sense, or did something happen that was different from what you anticipated? If so, try to explain why these data are different from your expectations.

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3. Using the class data, at what concentration(s) were the organisms affected immediately?
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4. Using the class data, at what concentration(s) did the greatest number of organisms die?
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5. ***Why*** are organisms affected when they are exposed to too much turbidity?

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6. What kind of graph did you make for your averaged class data? ________________

7. Why?

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8. How do your own group's data contrast with the average (this is called *variability)*? In other words, are your group data close to the average or do they vary greatly from one another? Why do you think this?

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9. If you wanted to repeat this experiment, explain what you would do to reduce the variability?

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10. Using the HRECOS website, look at the impact of two recent storms on turbidity in the Hudson River. We suggest using Hurricane Irene (August 26-September 3rd, 2011) and Tropical Storm Sandy (October 28-November 2nd, 2012) as good storms to observe. Tropical Storm Lee (August 30 – September 6, 2011) is another storm that shows dramatic changes.

    a. What were the maximum turbidity levels for the storms?
        i. Storm 1: ______________________
        ii. Storm 2: ______________________

    b. Do you think these high levels of turbidity caused a problem for aquatic life in the Hudson River? Why or why not?

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11. Based on what you've learned from this experiment, at what concentration of turbidity do aquatic organisms begin to respond? Are the turbidity levels found in the streams near the hydrofracking wells (which ranged from 1.9 to 10.1 NTUs) a problem? Why or why not?

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