Name: _____ Class: _____ Date: _____

Phosphorus and "Foggy" Water

Learner Outcomes:

- Identify chemical factors in an environment that might affect the health and distribution of living things in that environment

Key Terms:

Solubility	Basic	Phosphates
Precipitate	Acidic	

Background Information:

Phosphorus commonly combines with oxygen to form compounds called phosphates. These compounds in fertilizers and sewage can pollute water systems. Magnesium sulfate ($MgSO_4$) dissolves in water and reacts with phosphates (PO_4^{2-}) to form magnesium phosphate. This process occurs best in a solution that is basic. Magnesium phosphate does not dissolve in water so it forms a precipitate, causing water to appear cloudy. You can use magnesium sulfate to test water samples for the presence of phosphorus.

Research Question: When is phosphorus detected in water?

Hypothesis:

Materials:

Various water samples	Ammonium hydroxide solution	Test tubes
Sodium phosphate solution (TSP)	Magnesium sulfate solution	Test tube holder
		Medicine dropper

Procedure:

1. Place 10 ml of each water sample (distilled water, fertilizer water, detergent water, pond water/ snow, TSP water, shampoo water, dishwashing liquid water) in a different test tube. Add 20-30 drops of dilute ammonium hydroxide to each water sample to make the solution basic.
2. Carefully add 5 mL of magnesium sulfate solution to each sample. Let the test tubes sit for 2-3 minutes. Record your observations.

This investigation / activity has been adapted from:
Mah K, Martha J, McClelland L, et al. *Science in Action 9*. Toronto, ON: Addison Wesley.

Observations:

Sample	Qualitative Description of Sample Before the Test	Qualitative Description of the Sample After the Addition of Magnesium Sulfate
Water		
TSP Water		
Snow / Pond water		
Dishwashing Detergent		
Flower Food (Fertilizer)		
Shampoo		

Analysis:

1. In which samples did you detect phosphorus?

2. Why did you test distilled water?

3. Why did you test the sodium phosphate (TSP) water?

4. Why do you think that phosphorus was present in those samples?

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5. Why are many companies who produce dishwashing detergents advertising that their products are "phosphate-free"?

6. Do all fertilizers necessarily contain phosphates? Explain.

Conclusion: summarize the key sources of phosphates in urban and rural water supplies

Extension:

1. Use print and online resources to identify an area where phosphates in the water are a problem. Draw a picture to illustrate the source(s) of the phosphates, how they arrive in the aquatic ecosystem, and the impact they have on the ecosystem.

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