Name: ________________________ Class; ______ Date: ________________

Neutralizing Acids

Learner outcomes:

- Investigate, safely, and describe the effects of acids and bases on each other and on other substances (*e.g., investigate and describe the reaction that results when baking soda is dissolved; describe the role of acids and basis in neutralizing each other*)

Key Terms:

Acid	PH	Neutralization
Base	Neutral	

Background Information: When equal amounts of acidic and basic solutions of comparable strength are mixed, the ensuing reaction produces a neutral solution. This is very important to the chemistry of our stomachs. Hydrochloric acid, normally found in gastric juices, is necessary for the proper digestion of proteins in the stomach. Some patients suffer from acid indigestion, either from eating too much of certain foods or as a result of a weak lining in the stomach. In this case, an antacid (e.g., a base such as TUMS or milk of magnesia) can be administered to neutralize the excess acid in the stomach and provide relief. On the other hand, some patients suffering from hypoacidity, i.e., a lower than normal amount of hydrochloric acid in the stomach, are actually given dilute hydrochloric acid orally to overcome this deficiency.

Research question: What effect does mixing acids with bases or neutral solutions have on the resulting pH of the solution?

Hypothesis: predict what will happen when a baking powder mixture is added to vinegar.

Materials:

Water	dilute acid	50 mL graduated cylinder
pH paper	dilute base	
pH meter	baking powder	
blue litmus	2x50 mL beaker	
red litmus	Measuring spoon	

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

Procedure:

1. Place 2mL of baking powder in 30ml of water in a 50mL beaker. Test and record the pH of the resulting mixture.
2. Place 10mL of vinegar in a second 50mL beaker, Test and record the pH of the vinegar.
3. Stir the baking powder mixture and slowly add 10 mL of this mixture into the vinegar. Measure and record the pH of the resulting mixture.
4. Add the remainder of the baking powder mixture to the baking powder-vinegar mixture. Measure and record the pH of the resulting mixture.

Observations:

Solution/ mixture	**Observations**	**Initial pH**	**Acid / Base/ neutral**	**Final pH**	**Acid / Base / Neutral**
Baking powder and water					
Vinegar					
10mL Baking Powder + 10 mL vinegar					
30 mL baking powder + vinegar					

Analysis:

1. Was the pH of the vinegar-baking powder mixture different from that of the vinegar alone? Explain.

2. What evidence was there that a chemical change took place?

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3. What happened when you added more of the baking powder mixture? Explain.

4. What can we say about the amount of acid and base that must be added together to get a neutral solution?

5. Was your hypothesis correct? Why or why not?

Conclusion:

Extension:

1. Design an experiment to determine how adding water to a solution affects its pH. In your design, include an hypothesis with an explanation of what you expect to happen.

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