The Indicator of Magic

Theory/Background: The pH of a solution is the negative logarithm of the H+ concentration (molarity) usually written as [H+]. The pH scale runs from 0-14 and the value tells you whether a solution is acidic (0- less than 7); neutral (7); or basic (between 7-14).

Since the scale is logarithmic, it means that for every 1 number difference on the scale the concentration changes tenfold (ex: pH=3 is 100 times more acidic than pH=5)

Indicators are acids or bases which undergo color changes when they dissociate in specific pH ranges. For this experiment we will use an indicator known as phenolphthalein (phth) to test 2 common household cleaning products- Vinegar and Ammonia. Phth, like most indicators, works in a fairly narrow range of pH. For phth its effective range is between pH=8-10.

Prelab Questions:

1. What is one way of testing for the presence of an acid?
2. What ion is present to classify a substance as a base?
3. What is the abbreviation of the indicator, phenolphthalein?
4. Why are indicators used?
5. What quantities do you need to calculate pH?

Procedure:

Part I: Mini-titration of Acid and Base

1. Into a small beaker place 50 mL of deionized water. Add 5 drops of the phth to the water and note your observations in the data section.
2. Carefully add 5 drops of the ammonia solution record your observations and then stir the solution and note any changes.
3. Now, carefully add 5-6 drops of the vinegar to the solution and record your observations, stir the solution and note any changes in the data section.

Part II: Testing pH

1. Wash your spotplate.
2. With your pipette, place 4-5 drops of the mixture to be tested in a well.
3. Use your hydrion paper testing technique and record the color and pH.
4. To the same well, add 2 drops of phth and stir with your siring rod. Record color and pH range.
5. Repeat with the other mixtures.
6. Cleanup: Empty spotplate into sink and dilute with lots of water

Data:

Part I

Substance added to beaker	Observation
DI water	
Ammonia	
vinegar	

Part II

Mixture	**hydrion paper**		**phth**			
	color	pH	color	pH range	[H+]	[OH-]
shampoo						
school OJ						
oxyclean						

Discussion

1. Classify each of the 3 liquids or solutions you used as an acid, a base, or neutral, if you can (provide a reason for your answer).
2. If bromphenol blue indicator was used and vinegar was added first and resulted in a yellow solution what would you estimate the pH to be?
3. When pure water is left exposed to air the pH can drop to 5.5, which indicator would be best for testing the pH range and what color would you expect to see?
4. Here is a list of some common substances and their pH: lemon juice-*2.5*, blood-*7.4*, tomato-*4.5*, bleach-*12.2*, urine-*6.0*. Choose the appropriate indicator for testing each of these substances and predict what the solution's color would be.
5. Is there one indicator that would be appropriate to test both an acid and a base? If so, name it and explain what the solution would look like if you were to test both an acid and a base with it.

Conclusion:

Error Analysis: (do you have any?)

Resources: