Glass cleaner

When I was in grade 8, my calss voted for me to be a sanitary leader. My mission that giving the chance to my friends to keep my class always clean and shinny. For the first time, my works waere very ahrd becaue the board and tables had some dirtes couldn't remove, I used my whole strength just to do that. Day by day I though that I need some help, I asked my chem teacher because I thought she would gave me some chemical substance to finish my works easily. Suprisingly, she said I have to research for my own, I used internet for 1 week I knwo how to make a glass cleaner. The rest of years, it wasn't a difficluty in my jobs. I currently have chance to research about my "power" in the past in this year thanks to this experiment.

Glass cleaners have a tough job. They have to dissolve dirt and grime, leave a surface shiny, and most importantly, they have to do it all without leaving films. Glass cleaners usually contain solvents that adhere to the glass surface and lift away dirt and grime, providing shiny surfaces extra sparkle .This highly efficient combination helps to easily clean surfaces without leaving the strakes that appears in our mirrors and windows. The formulation of glass clenaer is based on the use of isopropyl alcohol that is an effective oil remover. Isopropyl Alcohol is also used to clean paint work after polishing to remove all residues left on the surface. The Isopropyl Alcohol based glass cleaner also contains certain agents and is soluble in water, that makes it made as a concentrate. Isopropyl Alcohol based glass cleaners evaporate when exposed to sun or air.

Since the isopropyl soluble in water, so I want to know more about that different concentrations of reacts with different columne of water which is known the most common solvent and extremely polar, many organic no solubility in water. By far the most widely used polar solvents are the oxygenated solvents such as alcohol. Adjusts pH to optimize cleaning performance and contributes to suspending soils. If adding the white Vinegar to ispropyl alcohol, the reaction would have the Propyl Ethanoate and water .

White Vinegar + Isopropyl alcohol -> Propyl Ethanoate and Water

$5\ CH_3COOH + 30\ C_3H_7OH \longrightarrow 20\ CH_3COOC_3H_7 + 3\ H_2O.$

This reaction we called it esters which are produced when carboxylic acids are heated with alcohols in the presence of an acid catalyst. And esterification requires an additional acid catalyst, preferably a strong, dessicating acid like $C_6H_8O_7$. If adding the white Vinegar to ispropyl alcohol, the reaction would have the Propyl Ethanoate and water. The glass cleaners work on the following principle and chemical reaction:

Hypothesis

The glass cleaners are expected to wipe all dust, paint and oils from the screens when used to wash. The isopropyl alcohol based liquids will remove the dust, paint and oils faster than the other cleaners. The pH of lemon juice is about 2, and the vinegar has a pH balance of about 3. The neutral water makes the substance a less acidic—around 5 or 6.5 on the pH scale—so that it is neutral than normal glass cleaner.(pH=8)

Research questions

How does the concentration of reactants would affect the effectiveness pH of the glass cleaning agent?

Materials

- 100ml Vinegar (CH3COOH)
- 100ml of water (H2O)
- 100ml of Isopropyl alcohol (C3H7OH)
- 75ml Lemon juice ($C_6H_8O_7$) that will act as Catalyst beaker
- pH meter
- Dirty beaker
- timer or stop watch

Method

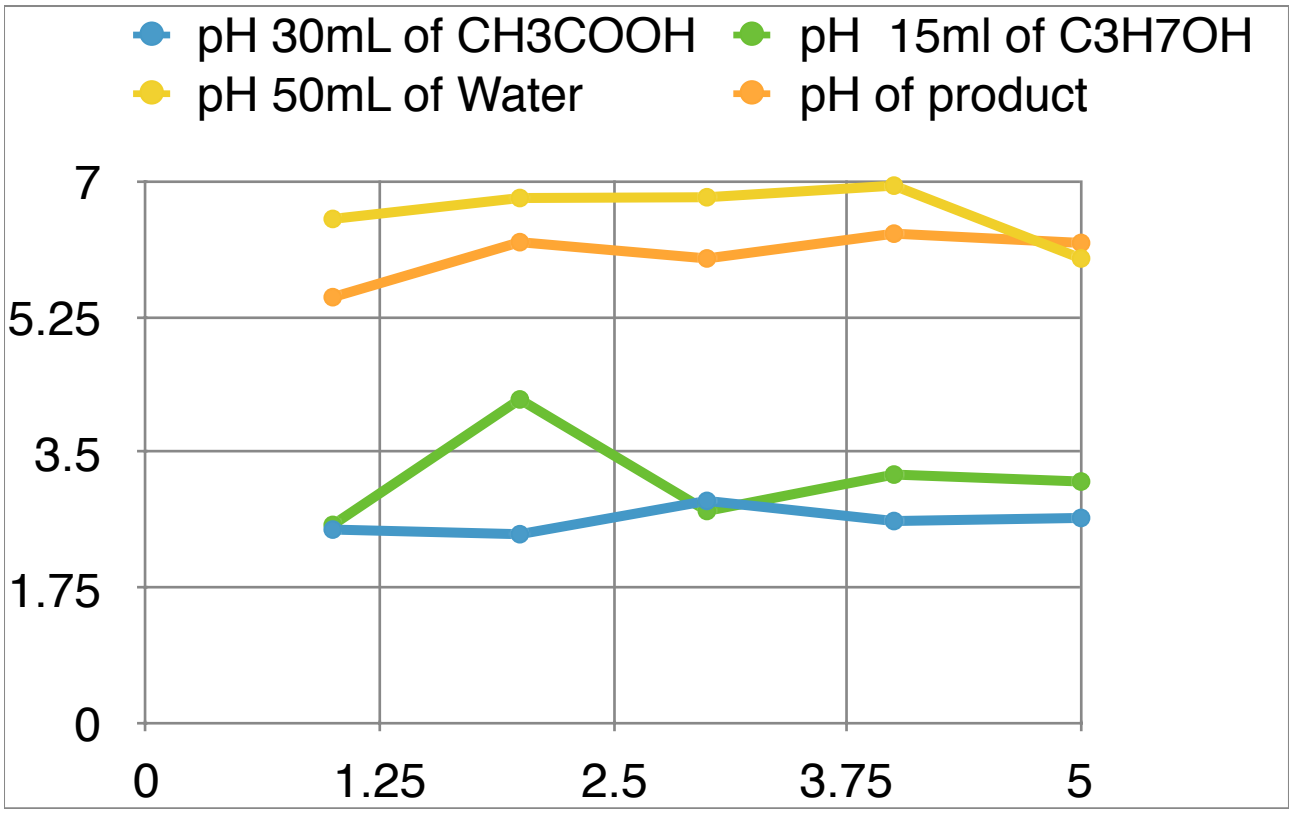
- Measure pH and concentration of all reactants and record in the table before you begin the experiment.
- Measure and add 20ml Vinegar into the glass beaker provided
- Measure about 20 ml of water, place in a cup and add 20ml cup of Isopropyl alcohol.
- Immediately the reaction will rinse out the measuring beaker
- Add 15ml of lemon juice ($C_6H_8O_7$)
- Mix all of the reactants for 2 minutes
- Then measure pH and concentration after all the reactants have reacted.
- Repeat the experiment two times and record the results in the table.

+First we use 30mL CH3COOH with 15mL of C3H7OH and 50mL Water

mL	Concentration of CH_3COOH	Concentration of C3H7OH	Concentration of Water
30m L	0.002	*	*
10mL	*	0.0028	*
50mL	*	*	0.0036

pH	1st Dial	2nd Dial	3rd Dial	4th Dial	5th Dial
30mL of CH_3COOH	2.5	2.44	2.87	2.61	2.65
20mL of C3H7OH	2.56	4.98	2.74	3.21	3.12
50mL of Water	6.51	6.78	6.79	6.94	6

	First	Second	Third	Fourth	Fifth
pH of products of	5.5	6	6.5	5.8	5.78

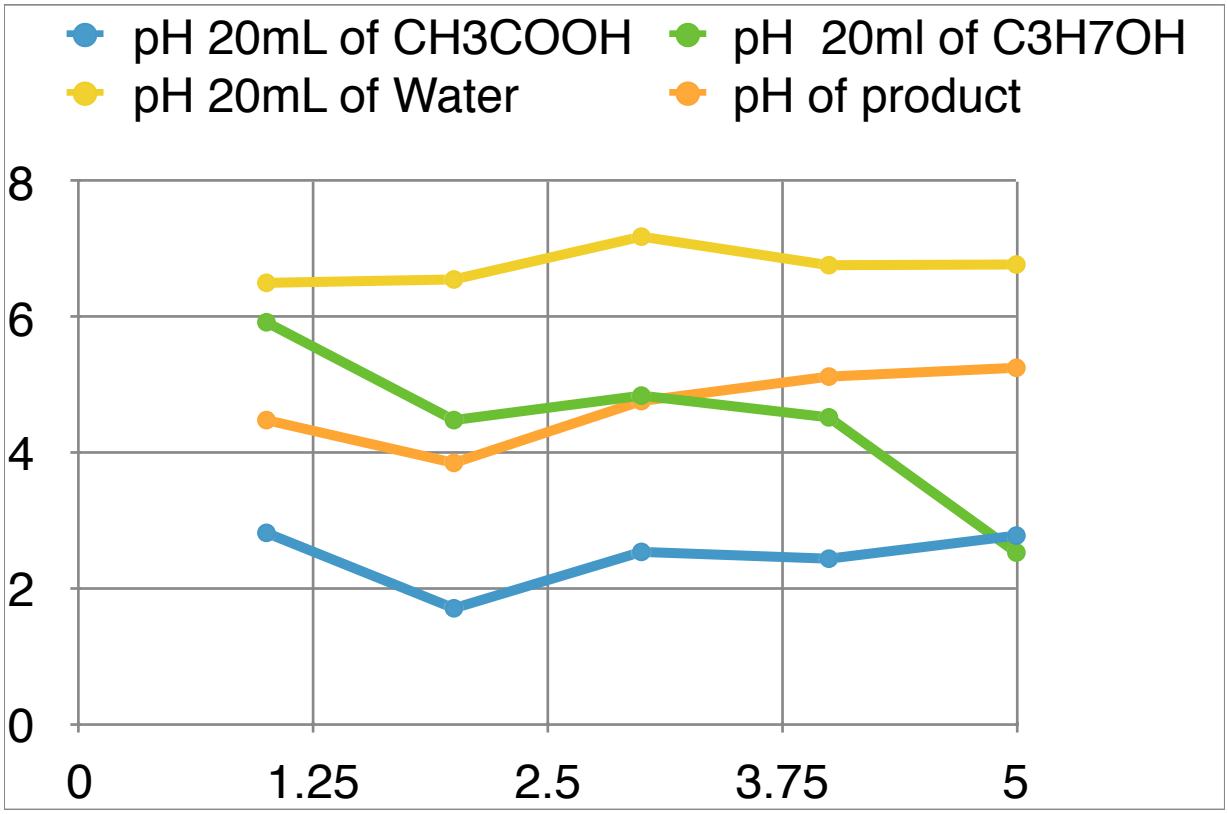


+ Second we use 20mL CH3COOH with 20mL of C3H7OH and 20mL of Water

mL	Concentration of CH_3COOH	Concentration of C3H7OH	Concentration of Water
20mL	0.003	0.0028	0.0096

pH	1st Dial	2nd Dial	3rd Dial	4th Dial	5th Dial
20mL of CH_3COOH	2.82	1.71	2.54	2.44	2.78
20mL of C3H7OH	5.92	4.48	4.84	4.52	4.53
20mL of Water	6.5	6.55	7.18	6.76	6.77

	First	Second	Third	Fourth	Fifth
pH of products of	4.88	3.85	4.76	5.12	5.25

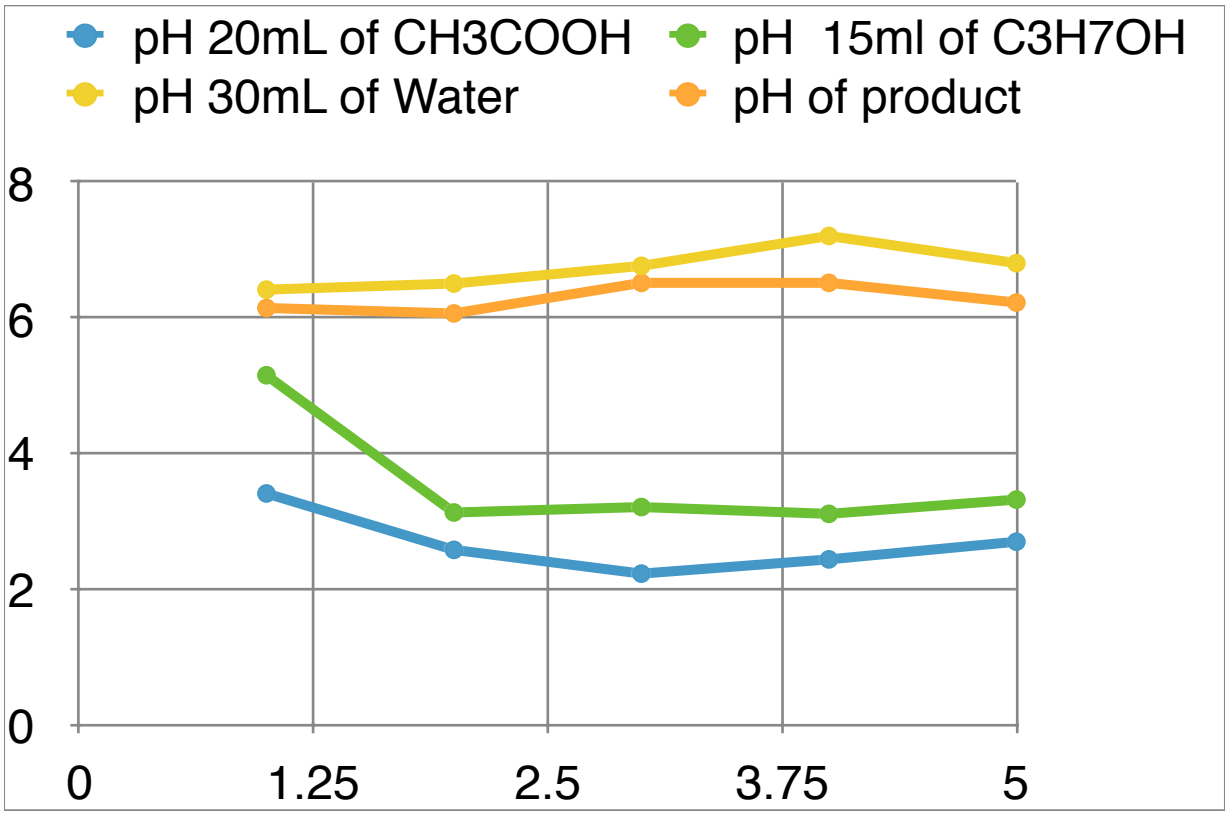


+Third 20mL CH3COOH with 15mL of C3H7OH and 30mL Water

mL	Concentration of CH_3COOH	Concentration of C3H7OH	Concentration of Water
30m L	*	*	0.0064
20mL	0.003	*	*
15mL	*	0.004	*

pH	1st Dial	2nd Dial	3rd Dial	4th Dial	5th Dial
30mL of CH_3COOH	3.41	2.58	2.23	2.44	2.7
20mL of C3H7OH	5.15	3.13	3.21	3.11	3.32
15mL og Water	6.41	6.5	6.76	7.2	6.8

	First	Second	Third	Fourth	Fifth
pH of products of	6.14	6.06	6.51	6.51	6.22

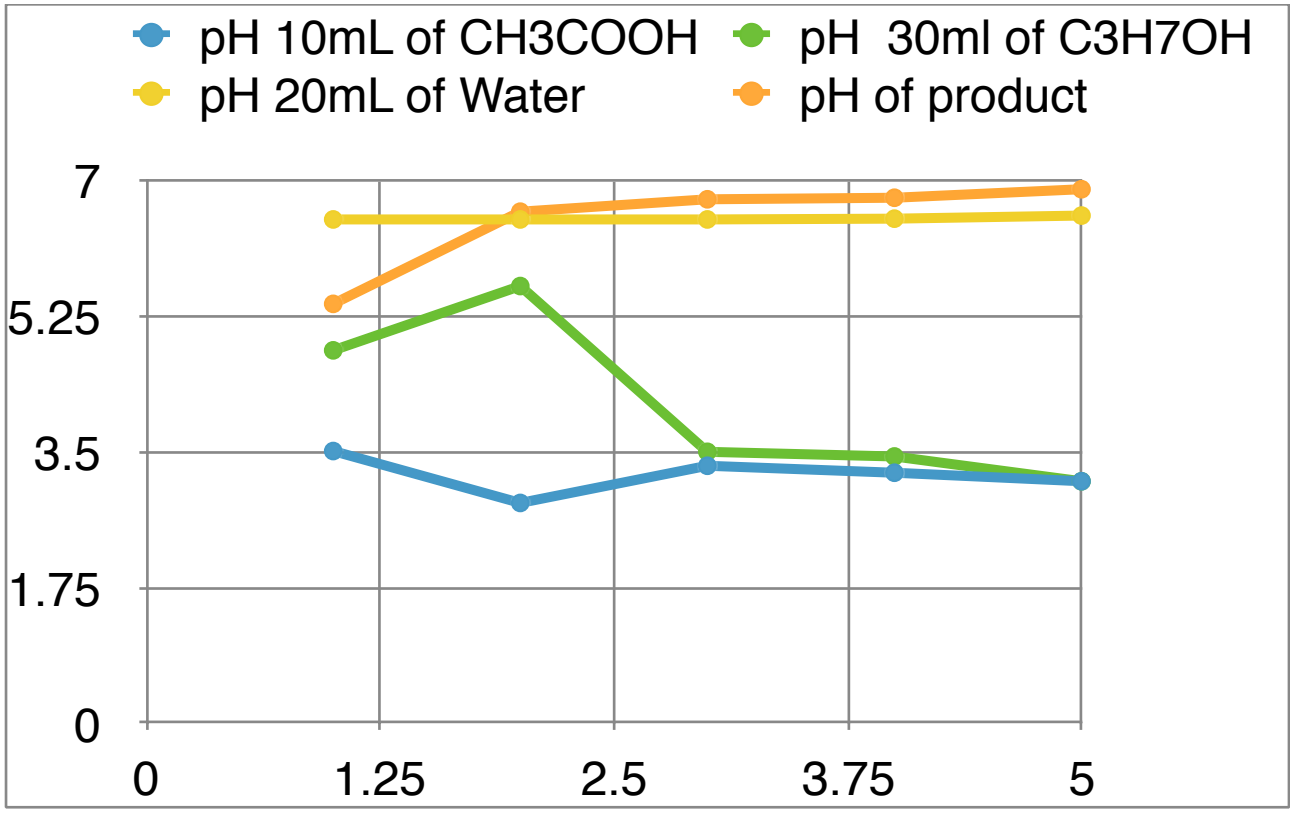


+ Fourth 10mL CH3COOH with 30mL of C3H7OH and 20mL Water

mL	Concentration of CH_3COOH	Concentration of C3H7OH	Concentration of Water
30m L	*	0.003	*
20mL	*	*	0.0096
10mL	0.006	*	*

pH	1st Dial	2nd Dial	3rd Dial	4th Dial	5th Dial
30mL of CH_3COOH	3.51	2.84	3.32	3.23	3.12
20mL of C3H7OH	4.81	5.64	3.5	3.44	3.5
15mL of Water	6.5	6.5	6.5	6.5	6.5

	First	Second	Third	Fourth	Fifth
pH of products of	5.41	6.6	6.76	6.66	6.63

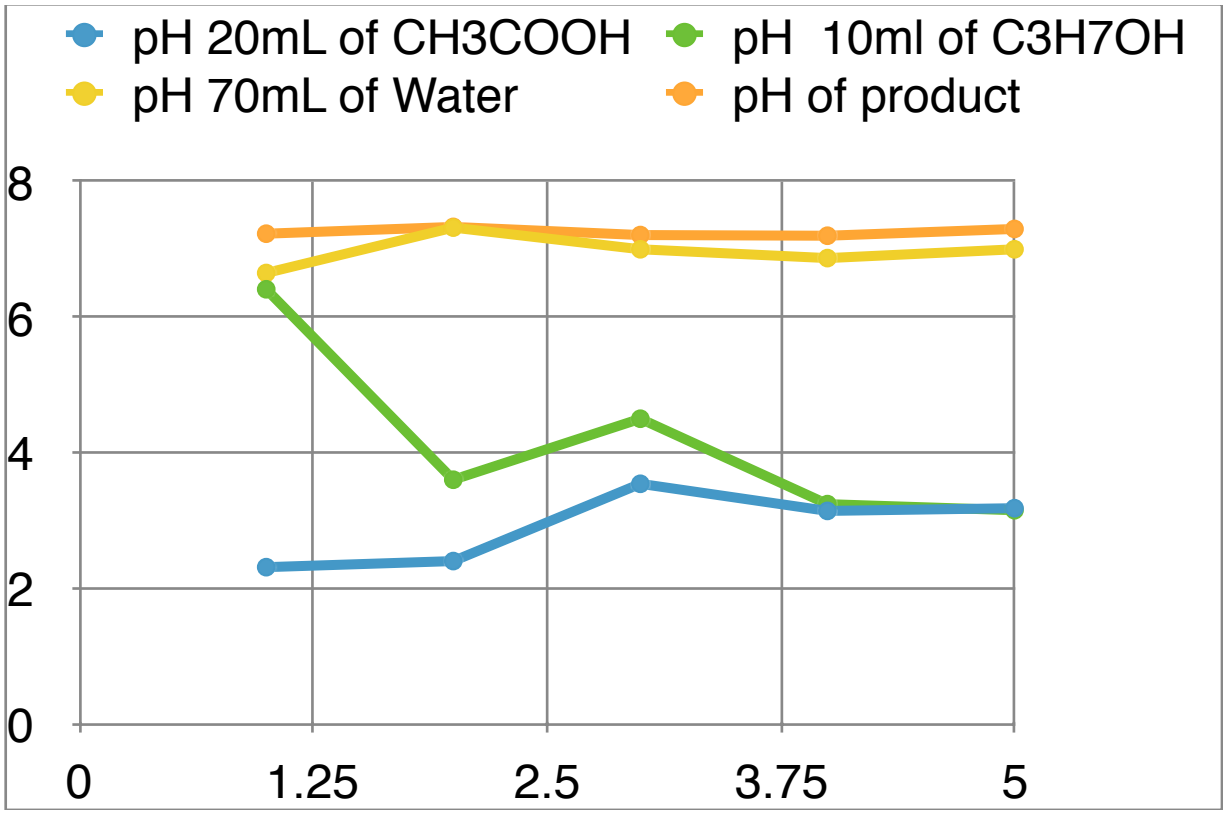


+Fifth 20mL CH3COOH with 10mL of C3H7OH and 70mL Water

mL	Concentration of CH_3COOH	Concentration of C_3H_7OH	Concentration of Water
70m L	*	*	0.00257
20mL	0.003	*	*
10mL	*	0.006	*

pH	1st Dial	2nd Dial	3rd Dial	4th Dial	5th Dial
30mL of CH_3COOH	2.31	2.4	3.54	3.14	3.18
20mL of C_3H_7OH	6.41	3.6	4.5	3.24	3.15
15mL of Water	6.65	7.32	7	6.87	7

	First	Second	Third	Fourth	Fifth
pH of products of	7.23	7.33	7.21	7.2	7.3



Variables:

Dependent

- Concentration of reactant

Independent

- volume of the reactants; vinegar, lemon juice and isopropyl alcohol

Controlled variable

- surface area of the dirty beaker

Safety information:

+ Always label the contents, label them clearly in Name of content. ”Vinegar Glass Cleaner," or "Isopropyl Alcohol and Vinegar Glass Cleaner,” with the date clearly. It is also wise to add the date when you mixed the ingredients.

+ You have to wear long pants and shoes instead of shorts and sandals. Use the pipette to take the acid.

Analysis:

As the concentration of the reactants is increased the rate of reaction increases, this causes the dirt on the glass beaker to be removed at a faster rate. At first when the vinegar is added to the beaker, no reaction happens and nothing is observed, upon addition of the isopropyl alcohol, a reaction is seen in the beaker and the beaker is cleaned.

Water contains calcium carbonate and therefore cannot effectively was the glass alone. Vinegar which is acetic acid when it comes in contact with calcium carbonate in water, a chemical reaction occurs. The first thing that happens is the protonation of the carbonate part of the calcium carbonate by acetic acid to make carbonic acid.

$2H^+ + CO_3^{2+} \Rightarrow H_2CO_3$

Along with the protonation, calcium reacts with the acetic acid to form calcium acetate as below;

$2CH_3COOH + CaCO_3 \rightarrow H_2CO_3 + Ca(CH_3COO)_2$

Addition of isopropyl alcohol neutralizes the acidity of both the carbonic acid and the remaining acetic acid to cause the cleaning of the glass beaker.

$H_2CO_3 + C_3H_7OH \longrightarrow CHCOOC_3H_7 + H_2O$ and

$5\ CH_3COOH + 30\ C_3H_7OH \longrightarrow 20\ CH_3COOC_3H_7 + 3\ H_2O$

Addition of the last ingredient, lemon juice clears all the dirt from the beaker. This shows that the lemon juice acts as the catalyst to speed up the reaction of vinegar and the lemon juice according to the following chemical reaction.

$5\ CH_3COOH + 30\ C_3H_7OH \longrightarrow 20\ CH_3COOC_3H_7 + 3\ H_2O$

In the conclusion, The higher the concentration of the reagents causes the reaction to be faster and thus the faster the cleaning of the glass beaker. Addition of a catalyst increases the speed of the reaction and hence cleans the surface of the beaker quickly. Isopropyl alcohol based cleaners are the based when it comes to cleaning of the glasses. They are easily removed and dry faster than other cleaners. The Isopropyl Alcohol based glass cleaner also contains certain agents and is soluble in

water, that makes it made as a concentrate. Isopropyl Alcohol based glass cleaners evaporate when exposed to sun or air.