Day 1-

Order of the potentiometers: High sensitivity

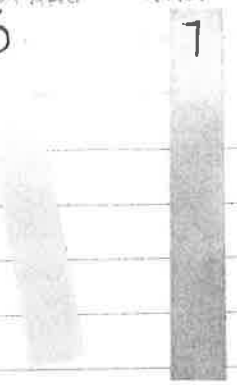
Observations -

- Un-successful trial
- Pump kept pumping, all the vinegar solution went into the baking soda solution
- The baking soda solution has a lower pH than the neutralized solution
- The baking soda solution went from a low pH (blue) solution to a high pH (yellow) solution
- The water level went up as the vinegar solution was pumped into the baking soda solution, and the water level went down in the vinegar cup as the vinegar was pumped out
- When the baking soda and vinegar solutions combined, they created bubbles
- Originally the sensor didn't work and did not pump the solutions
  - This prompted me to re-check my circuit and reconnect all the wires
- Styrafoam did not float very easily
- The cups were difficult because they were tall and narrow
  - Use wide, open bowls

Day 2 -

Baking Soda solution after: 5

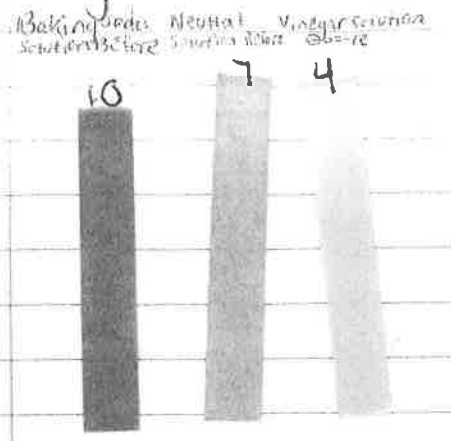
Neutral solution after: 7

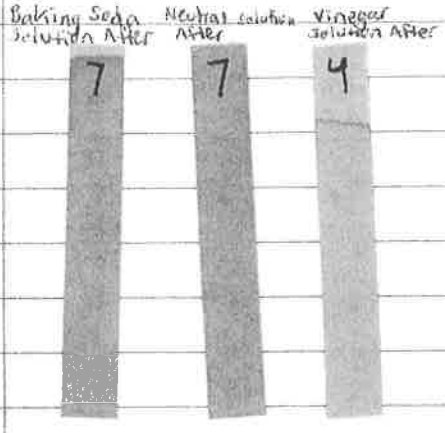


Observations -

- Hard to make baking soda dissolve in big bowls
- The sensor will not float in the bowls (too shallow)
- The bubbles did not dissolve/ dissappear in the neutral solution
- The pump suddenly turned off and did not turn back on
  - Possible short circuit or wires touched
- Failed trial
  - Pump did not pump at the start
- Vinegar pH was acidic (3-4), neutral was pH (6-7) and baking soda was pH (5-6)
- Vinegar started at 200 mL and after it was pumped there was 44 mL left
- 156 mL of vinegar was pumped into the baking soda solution
- Next time try narrow bowls
  - Meet between the bowls and the cups
- Rinse sensor with baking soda solution, also with the tubes
  - Wipe with a paper towel
- New copper, better sty/ foam
- Better tape (to-size)

Day 3-





Observations-

- It was hard to see through the brown bowls, couldn't figure out when the baking soda was dissolved
- The bowls are wide, making it hard to pour into the graduated cylinder
- The pump would not turn on when I put the sensor into the baking soda solution
- Failed trial
  - Pump kept pumping
- The bowls were too small, tall-wise, the mixtures almost overflowed onto the table, and when the baking soda and vinegar combined they fizzed a lot
- The baking soda went from a basic to an acidic (9 pH → 4 pH)
  - Did not neutralize
- The bamboo bowls dissinegrated in the vinegar bowl, residue was left behind
- The baking soda went from a blue solution on the Bromothymol Scale (pH) to an orange-yellow solution

BSS - Baking soda solution

- Basic → Acidic

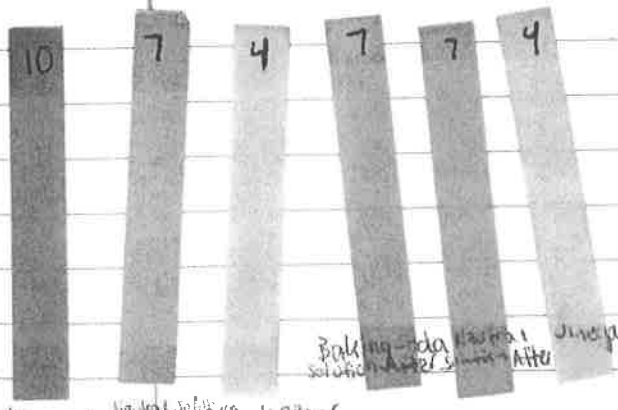
- I had to reconnect some of the wires, once I did the pump ran by itself
- The baking soda bowl needs to be the biggest because it use to hold up to 300 mL (milliliters) 100 mL from original baking Soda Solution plus another 200 mL from the vinegar Solution
- Vinegar solution went from 200 mL to 44mL (156 mL we used)

Day 4-

Potentiometers

Original

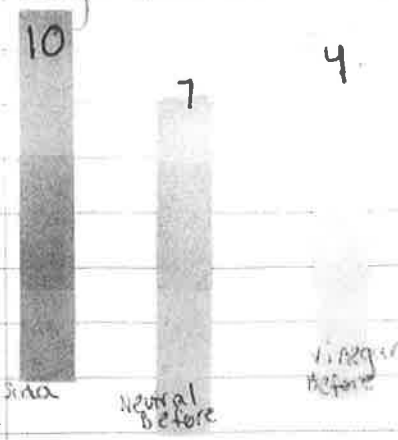
This test

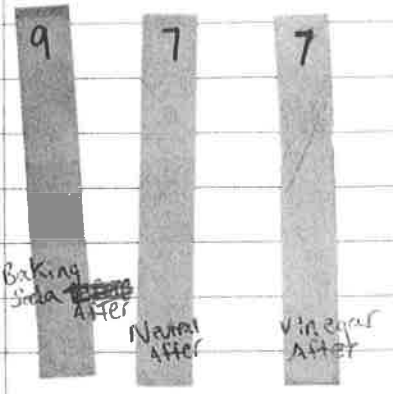


Observations -

- All the knobs turned the sensor on or off
- Used purified water instead of distilled water
- When the sensor was placed in the baking soda solution bowl the pump did not run
- Turn counter-clockwise to turn on, turn clockwise to turn off
- Put the sensor back into the neutral solution, adjusted the potentiometers, then placed it back in the baking soda soluti
- Stopped the pump when the acid-base reaction stopped (no more bubbles)
- Sensor slowed down at the end
- Sensor doesn't detect to the leve required to automatically shut the system off, forcing me to obser reaction completion
- Vinegar solution went from 20 mL to 84 mL (116mL were used)

Day 5-





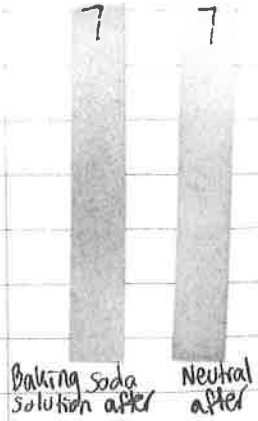
Observations-
- Measured pH index of refraction instead of sugar index of refraction
- Baking soda had the highest index of refraction, neutral had the middle index of refraction, the vinegar had the lowest index of refraction
- Stopped the pump too soon
- Vinegar went from 200 mL to 126 mL (74 mL were pumped)
- Baking soda had a high (8-9) pH at the end
- Redo the circuit to make the sensor more accurate
- The first time I tried to pump the vinegar solution into the baking soda solution the pump would not turn on
- I had to re-calibrate the sensors sensitivity with the potentiometers
- I put the pipet in the Bromothymol Blue solution, changing it from yellow to blue
- Only use the pipets for the prism, not in the color indicator solution
- Experiment was unsuccessful most likely due to early pump termination

Day 6-

Observations:

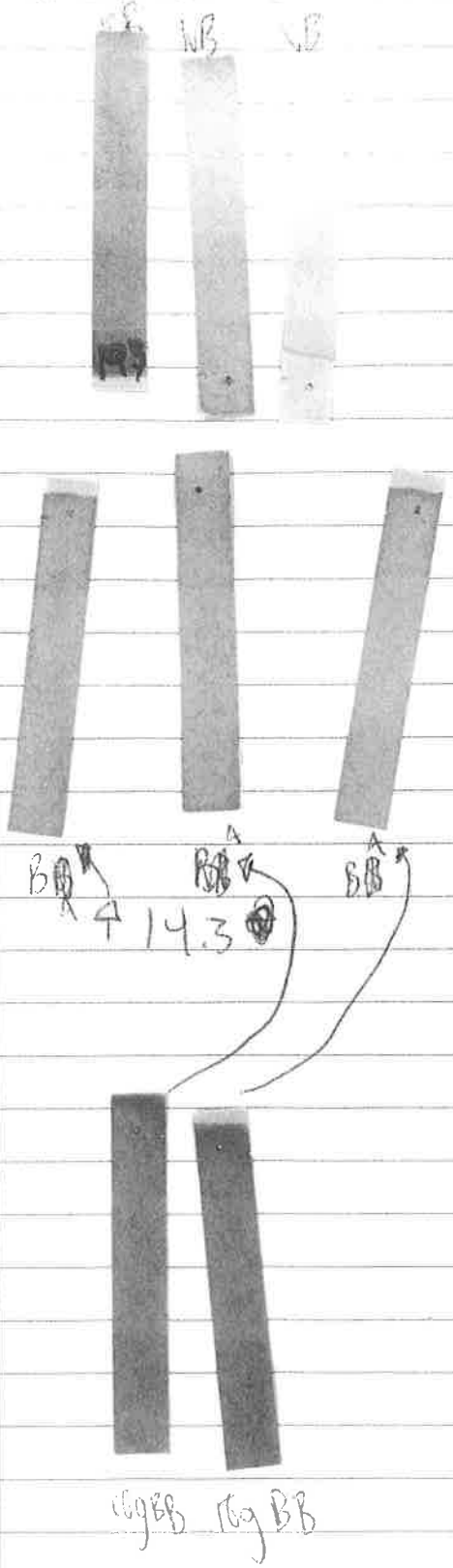
- Refraction marks were not the same as day 5
- The prism has a small leak at the bottom
- Trial went by smoothly
  - NO PROBLEMS
- Make a new sensor, the copper is starting to deteriate
- The baking soda end pH was very similar to the neutral pH
- The pump slowed down when the chemical reaction stopped
- The refraction mark for the baking soda end solution and the neutral solution were very close
- Used distilled water instead of purified water
- I think I did a better job predicting when the solutions get to their neutral point
  - I Stopped (chocked the pump) the pump when the bubbling chemical reaction between the baking soda and vinegar was done
- The vinegar went from 200 mL to 106 mL (94 mL were pumped into the baking soda solution)

Day 7 -



Observations:
- Target board looked similar to day 5 target board
- The baking soda creates a foggy residue when sturring, making it hard to know when the solution is dissolved
- Trial went very smoothly
- Forgot to measure the pH's of the solutions before
- Got new bromothymol blue solution
- Vinegar ended at 90mL left (110 mL of vinegar solution was pumped into the baking solution)
- End baking soda (new mark) was in the middle of the neutral and vinegar mark, meaning it was more to the acidic side
- The baking soda after pH was a yellow green color
- Next time rewire and reconnect everything to add more accuracy
- The laser pointer is starting to lose power (add new batteries

Day 3 -



Observations -

- The high concentration baking soda solution was a murky white, didn't fully dissolve compared to the clear lower concentration baking soda solutions
- Laser didn't shine through 2 not-wiped-down prisms, had to wipe it down
- 18 g solution was closest to the water mark
- 16 g farthest left, 14 g in the middle 18g farthest right

Day 1 and 2 -

BB NB VB observations -

5.2 PH

5.2 PH

BA NA VA

↑ 1.0 mol Baking Soda ↑

BB NB VB

8.1 PH

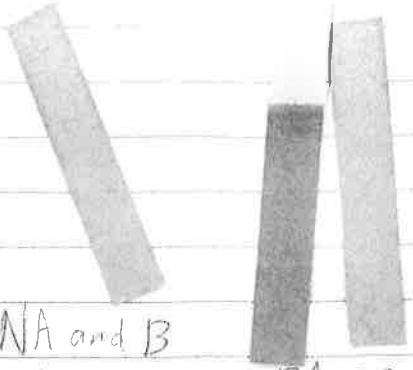
Day 1 and 15 continued -

BA NA VA Observations -

5.3

Day 11 —

0.5 M results — Observations —



NA and B
pH = 5.4

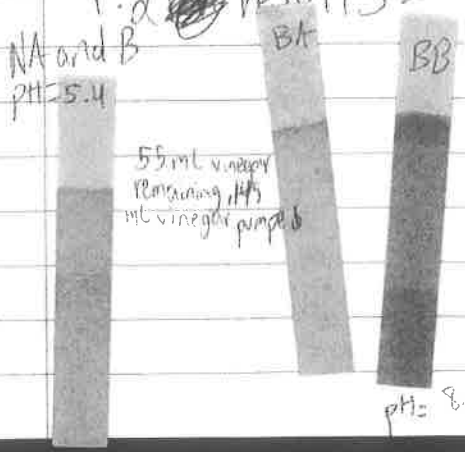
BA BB
pH = 7.9

136 mL vinegar left, 64 mL vinegar pumped

pH - 6.3

Sugar

1.2 M results —



NA and B
pH = 5.4

55 mL vinegar remaining, 145 mL vinegar pumped

BA

BB

pH = 8.1

Day 12-

Observations-

Green has the most effect, then red, then blue

Does the bromothymol blue solution have any effect on the pH?