PROFESSOR PRESSURE

Here we go again… and again… and again… and again!

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EXPERIMENTAL PURPOSE:

The purpose of this project is to determine how added pressure affects the rate off a Briggs-Rauscher oscillating chemical reaction.

DRIVING QUESTION:

How does adding pressure affect the cyclic rate off a Briggs-Rauscher oscillating chemical reaction?

HYPOTHESIS:

I believe that the added pressure will affect the reaction rate by speeding up the cycle. I think that will happen because the pressure will push the chemicals closer together. Since the reacting components are closer together, that will therefore speed up the rate of the process.

MATERIALS:

- 30 mL of hydrogen peroxide
- 30 mL of starch solution
- 30 mL of potassium iodate
- Test tube with special pressure lid
- Plastic tubing
- Drill
- Air compressor
- Stopwatch
- 3 eyedroppers

PROCEDURE:

- Start by making modified plastic test tubes. The test tubes must have lids that screw on tightly and securely. In the lids, use a drill to put a small hole in each lid. The hole is the size of the plastic tubing so that it fits tightly. Then run the piece of plastic tubing through the hole in the lid and glue it with hot glue. This will ensure there is no leakage around the tubing when the tube is pressurized.
- Add 2mL of hydrogen peroxide to test tube via eyedropper.
- Add 2mL of starch solution to test tube via eyedropper.

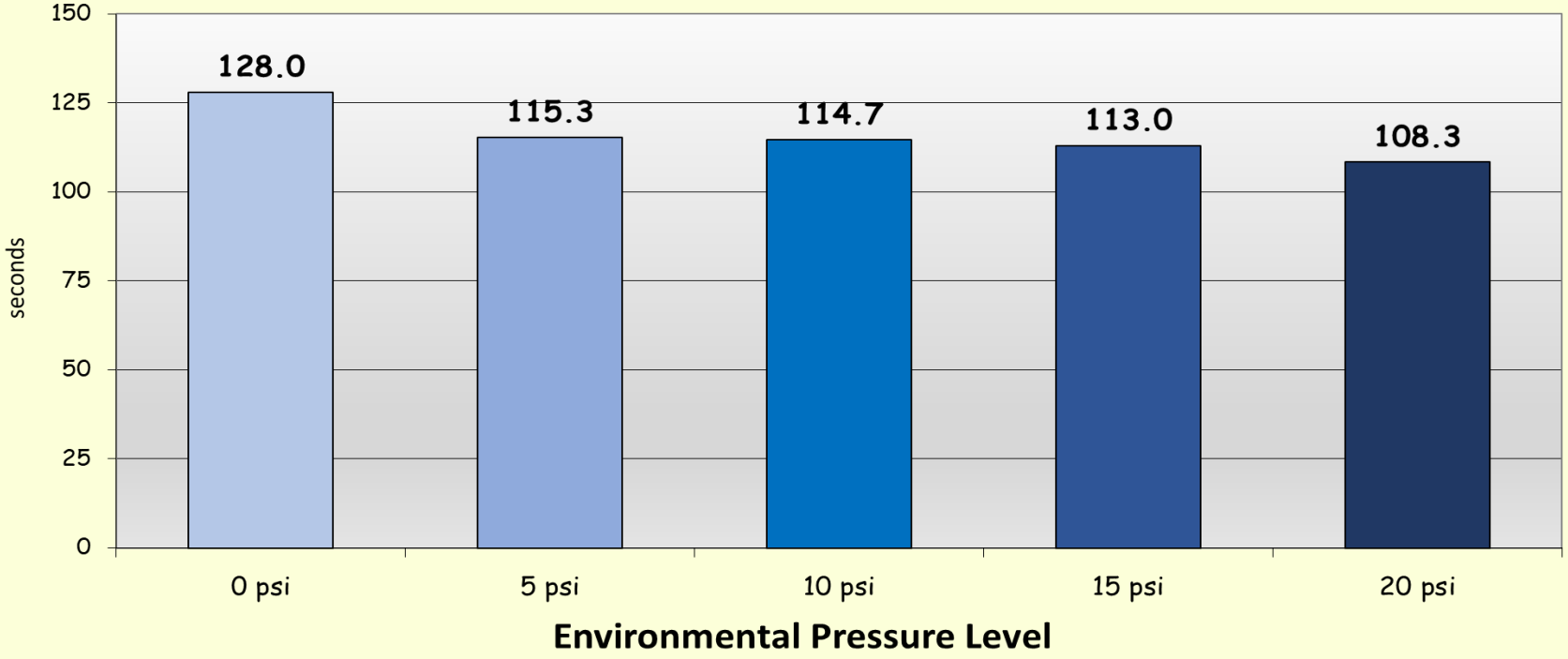
PROCEDURE (continued):

- Add 2mL of potassium iodate to test tube via eyedropper.
- Then immediately screw special pressure cap on top of the test tube.
- Add pressure to the test tube using the air compressor.
- Hold the tube on the lid by clamping it with your fingers.
- Wait one cycle of reaction while adding the pressure.
- Start the stopwatch, count ten cycles from that point forward, and then stop the stopwatch.
- Repeat 3 times with each pressure amount.

Data: Time to complete 10 cycles of the oscillating reaction under different pressure levels (seconds)

Test	0 psi	5 psi	10 psi	15 psi	20 psi
Test #1	123	112	119	110	113
Test #2	127	115	114	112	105
Test #3	134	119	111	117	107
Average	**128.0**	**115.3**	**114.7**	**113.0**	**108.3**

Average Time to Complete 10 Cycles of the Oscillating Reaction (seconds)



RESULTS: ***As the pressure level increases, the rate of the reaction becomes faster.***

CONCLUSION:

My hypothesis was correct. As you increase the pressure, the cycles' rate changes and speeds up. Now I know that the added pressure will affect the rate by speeding up the cycle. Although, within the experiment, I believe that it will eventually stop speeding up when you add too much pressure. The reaction will eventually stop gaining in rate when you add to much pressure because of the principle of diminishing returns, which explains that the benefits gained from something will eventually have a smaller gain as more (pressure, in this case) is invested in it.

REFERENCES:

Sources utilized when collecting background information to understand how an oscillating chemical reaction works:

- *diverdi.colostate.edu/C431/experiments/simultaneous/references/oscillating*
- *chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry*
- *futurumcareers.com/why-do-some-chemical-reactions-oscillate*
- *www.math.nagoya-u.ac.jp/~richard/teaching/f2025/SML_Duong_2.pdf*
- *chemistrytalk.org/briggs-rauscher-reaction/*