**Comparative analysis of catalase activity in various vegetable sources**

**Hypothesis:** Different vegetables sources in the catalase reaction will result in varying rates of oxygen release, indicating that catalase activity differs among vegetables.

**Null hypothesis:** Different vegetable sources will not show different catalase levels between them.

**Equipment**

* Celery, onion, mushroom, and carrot - used as the independent variables.
* Knives - used for dicing of vegetable to create maximal surface area.
* Kitchen scales - weighing out amount of vegetable source.
* Universal buffer (pH 7) - to maintain a constant pH and as a solution for the reaction to occur.
* Detergent - to visualise the capturing of oxygen from the reaction.
* Timers - to keep track of the reaction progress.
* 10% hydrogen peroxide - to react with the catalase enzyme within the vegetable sources.
* Autopipette - to measure out Hydrogen Peroxide.
* Measuring cylinders - to measure out universal buffer, as a container for the reaction, and to measure out the bubbles produced from the reaction.
* Room temperature (19-25°C) - a consistent temperature for use a control variable.

**Controls:**

We will have a control of one vegetable. Any more than that is a waste. All aerobic organisms contain catalase, so we can say with a high degree of certainty that one vegetable will be a plentiful base.

**(Edit this later to sound less aggressive, reword it, reference it properly, or remove entirely. I believe it is necessary to state some background though – this info was taken from Britannica.)**

**Variables that will remain consistent:**

* The amount (20mL) of pH 7 buffer,
* 3 drops of detergent,
* 2mL 10% Hydrogen Peroxide,
* Consistent room temperature varying between 19-25°C, and
* 5g of a given vegetable source.

**Positive control:** Celery with Hydrogen Peroxide

Aerobic organisms all contain the catalase enzyme meaning the celery should produce oxygen,

shown by the bubbles.

**Negative control:** Celery without Hydrogen Peroxide. We will test the celery without the Hydrogen Peroxide as we know it will not react in a neutral pH solution.

**Independent variable:** Vegetable source

**Dependent variable:** Bubbles produced from the production of oxygen.

**Replicates**

We will do each test with each vegetable source three (3) times to account for human error and to

create a mean production of O2 bubbles. This will equate to a total of 12 non-control experiments.

**Positive control:** No changes to treatment from basic protocol.

**Negative control:** Not using Hydrogen Peroxide in the treatment.

**Method**

1. Using a razor blade, carefully cut the vegetable source into fine pieces (WARNING: Sharps; risk of cuts; use great care. RISK: Low).
2. Using the balance, weigh out 5 grams of the finely cut vegetable source.
3. Pipette 20 mL of Universal buffer (pH7) into a 100 mL measuring cylinder.
4. To the cylinder add 3 drops of detergent and gently swirl until buffer and detergent are mixed. Avoid creating bubbles.
5. To the cylinder add the 5g of vegetable source. If the pieces are stuck to the sides, push them down into the buffer solution.
6. Make a note of the volume in each cylinder and record it in your data sheet. This is essential to calculate the rate of reaction.
7. If you are completing more than one test, label each cylinder according to the test it belongs to, and set the timer for 15 minutes.
8. To the measuring cylinder add 2 mL 10% hydrogen peroxide and immediately start the timer.
9. Note the volume of foam created in the measuring cylinder and record it in your datasheet after 5, 10 & 15 minutes.
10. Repeat each step for each vegetable source.