**IB Foundation Years (9 & 10) Lab Report**

**1) Writing a fully focused research question**

o Must include the range of the independent variable with units

o Must include the dependent variable

o Method of measuring the dependent variable

What is the effect of temperature ( 25,37,70 celsius) on the rate of the reaction catalyzed by enzyme (enzyme activity) measured by the volume of gas connected in the tube (cm^3) on 3 trials for each temperature, this will be done by measuring the volume of gas produced using a measuring tube

1. **Scientific background** 
   * Research your independent variable
   * Research its effect on your dependent variable
   * Research the method of measuring the dependent variable
   * Include citation

**As the temperature increases so does the rate of enzyme activity**. Optimal activity is achieved at the optimum temperature for the enzyme. As the temperature continues to rise, the shape of the enzyme's active center changes, resulting in a sharp drop-in activity. As with many chemical reactions, the rate of enzyme-catalyzed reactions increases with increasing temperature. At higher temperatures, however, the rate slows down again as the enzyme reaches its optimum temperature, denatures, and becomes incapable of functioning.

The method of measuring the dependent variable (volume) while changing the independent variable (temperature) is counting the bubbles produced (gas) in one minute

1. **Hypothesis:** Outline a hypothesis to predict the outcome of the experiment and

explain it using logical scientific *reasoning (what do you think is going to happen*

*As the temperature increases, the amount of gas produced increases, up to a certain point where the enzyme reaches its optimum temperature, the enzyme denatures and the amount of gas begins to decrease.*

**Enzyme yeast sugar**

**Scientific explanation for hypothesis (**This is the explanation to the previous hypothesis. Why do you think that your hypothesis is correct? Explain it in detail with reasons and causes. You may also find research at this point if allowed).

Because:

As the temperature increases, the kinetic energy of the gas molecules increases, and their velocity also increases. Also, their intermolecular forces weaken, resulting in the expansion of spaces between the molecules, which in turn leads to an increase in the volume, it increases until it reaches the optimum then it decreases

1. **Manipulating the variables:**

**What is your independent variable?**

* What are the units?
* How will it be changed stating the instruments that you will be using
* Will you be doing a control experiment?
* Why did you choose this range?

**Discuss your dependent variable [ the method of measurements + units+ time frame]**

Degree Celsius/cm3

The 37c is the control

We selected 25–70 since 25 was room temperature and 70 was the catalase's optimum reactivity. the enzyme activity changes with the variables

|  |  |  |
| --- | --- | --- |
| **Controlled Variable** | **How will you keep this controlled? Stating the values and the equipment that you will be using** | **How could it affect your results if not controlled?** |
| Temperature of water | control the temperature of the water using a water bath | won’t be able to record a precise result, as we won’t have a specific temperature |
| Amount of catalyst used | Measuring the exact same amount of catalyst for all trials | It will affect the results (un accurate) |
| Type of catalase | The same type of catalase for all trials | It will affect the results (un accurate) |

1. **Materials and Method**:

State your materials [ number needed + units] (Be descriptive, example: 10cm3 graduated cylinder) include the uncertainties for each piece of apparatus

**Method: What are the steps of the investigation?**

**1: measure enzyme to be at the same size and weight**

**2- measure 5cm of hydrogen peroxide for 3 samples**

**3-label each tube for (25c,70c,37c)**

**4- put them into water bath for different temperatures**

**5-** **set up inverted measuring cylinder**

**6- connect them via a tube into the underwater cylinder**

**7-after one minute count the number of bubbles produced**

**8-repeat them for all different trials**

o State step by step your method [ must be clear and easy to follow]

o **Draw and annotate a diagram or add an annotated photo in the space (** This annotated (labeled) diagram of your equipment set up.

o State the number of trials per increment of the independent variable

MEASURMENTS:

1 plate

1 conical flask ()

1 water bath (25c,70c,37c)

1 rubber tube

These are the materials for only 1 trial

1. **Safety, Ethical and Environmental issues**
2. **Results**

**Add a table of qualitative results. Variations within processed organisms/biological materials; changes in color, texture, shape, size, heat. Something I noticed that could affect the results.**

**Raw Data**

* Construct a table to add your raw data , add a fully detailed title to your table .
* Label your table ( table 1, table 2…)
* Add suitable headings with units and uncertainties to your table.
* Unify your decimal points

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature (c ) | Trial 1 (volume of gas collected) | Trial 2 (volume of gas collected) | Trial 3 (volume of gas collected ) |
| 25 | 20 | 21 | 20 |
| 37 | 63 | 61 | 65 |
| 70 | 5 | 3 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Processed data**   * Justify the reason for data processing * Add screenshots from excel to provide evidence for your work, or provide a sample calculation * Construct a table to add your results * Add a title for your table and label it * Unify your decimal points  |  |  |  |  | | --- | --- | --- | --- | | Temperature | Trial 1 | Trial 2 | Trial 3 | | 25 | 0.3 | 0.35 | 0.33 | | 37 | 1.05 | 1.01 | 1.08 | | 70 | 0.08 | 0,05 | 0 | |