



## 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 volume of gas connected in the tube (cm<sup>3</sup>) on 3 trials for each temperature, this will be done by measuring the volume of gas produced using a measuring tube?

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

### 2) Scientific background

- o Research your independent variable
- o Research its effect on your dependent variable
- o Research the method of measuring the dependent variable
- o Include citation

As the temperature increases, the rate of enzyme activity also increases. Optimal activity is achieved at the optimum temperature of the enzyme. The continuous increase in temperature leads to a sharp decrease in activity due to the conformational change of the active site of the enzyme. As with many chemical reactions, the rate of enzyme-catalyzed reactions increases with increasing temperature. However, at high temperatures, the rate drops again when the enzyme reaches the optimum temperature and becomes denatured and can no longer function. The method of measuring the dependent variable (volume) while changing the independent variable (temperature) is to count the number of bubbles produced (gas) in one minute

**3) 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*)

Citations/References:

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.

**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 so does their velocity. Also, their intermolecular forces weaken, the intermolecular space expands, the volume increases, increases until it reaches an optimum value, then decreases

#### 4) 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]**

Enzyme activity varies with variables

37c is the control

Celsius/cm<sup>3</sup>

We chose 25-70 because 70 is optimal for catalase reactivity and 25 because it is at room temperature.

Controlled Variable	How will you keep this controlled? <b>Stating the values and the equipment that you will be using</b>	How could it affect your results if not controlled?
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<u>Amount of catalyst used</u>	<u>By measuring the exact same amount of catalase</u>	<u>Won't be a fair test and won't be accurate</u>
<u>Temperature of water</u>	<u>By using a water bath</u>	<u>Accurate results cannot be recorded as there is no specific temperature</u>
<u>Type of catalase</u>	<u>Same type of the catalase</u>	<u>Won't be a fair test and won't be accurate</u>

## 5) Materials and Method:

State your materials [ number needed + units] (Be descriptive, example: 10cm<sup>3</sup> graduated cylinder) include the uncertainties for each piece of apparatus

3 different water baths (25c,70c,37c)

Per one trial:

- 1 plate
- 1 conical flask
- 1 rubber tube

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

- 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

1: Measure so that the size and weight of the enzyme are the same

- 2: Measure 5 cm hydrogen peroxide for 3 samples.
- 3: labels for each tube (25c, 70c, 37c)
- 4: put in water bath with different temperature
- 5: Reverse graduated cylinder setup
- 6: Connect to the underwater cylinder with a hose
- 7: After 7-1 minutes, count the number of bubbles generated
- 8: Repeat them on all different trials

## **6) Safety, Ethical and Environmental issues**

- 1) Wear gloves and handle hydrogen peroxide carefully
- 2) Please handle the glass carefully so as not to break it.
- 3) Carefully dispose of the hydrogen peroxide in the sink without scattering it
- 4)Wear lab coat
- 5)Use goggles

## 7) Results

**Add a table for qualitative results e.g. Variation within the organism/biological material being are dealt with; Color, texture, shape, size, heat changes; Anything you notice that might affect 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