



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 the change of temperature (20 degrees, 37 degrees, and 70 degrees) on the amount of gas produced measured in Milliliters (place yeast in 3 different temperatures, and measure the amount of CO₂ given out measured by the amount of water displaced by the gas in a measuring cylinder, in a set amount of time measured by a stop watch in seconds)

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

The Independent variable is the temperature

Different enzymes have different optimum temperatures, so as the temperature changes the enzyme either works better or denatures and stops working

We will measure the effect of different temperatures on enzymes by placing enzymes in 3 different temperatures and allowing them to catalyze a reaction which releases CO₂, and we will measure the amount of gas that displaces the liquid water in a tube.

Cited to Miss Mais and Biology class :)

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*)

If the temperature increases then the gas production will increase until the optimum temperature for the enzyme is reached, and then it will begin to decrease

Citations/References:

Scientific explanation for hypothesis

Because: after the enzyme reaches it's optimal temperature, it will denature and will no longer work, which decreases the rate of reaction.

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 ?

Temperature = degrees Celsius

It will increase or decrease, and we will be changing it using an electronic heater/cooler

There is a enzyme working at body temperature

Because the average room is at room temperature (20 degrees), the human body is at 37 degrees, and we wanted a hot temperature so we chose 70 degrees

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

Volume of gas = Cm³

There will be a cylinder full of water, and the gas will displace this water, and we will measure the volume of the cylinder which is now filled with gas

We will give each enzyme about around 2 minutes to work, and then we'll measure the results

| 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? |
|-----------------------------|---|---|
| Volume of water in cylinder | Measuring the water with a measuring cylinder | Unreliable, inaccurate numbers |

| | | |
|-----------------|-------------------------|--------------------------------|
| Mass of yeast | Using a top pan balance | Unreliable, inaccurate numbers |
| Amount of sugar | Using a top pan balance | Unreliable, inaccurate numbers |

Commented [M1]: Write more details in the 3rd column

5) Materials and Method:

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

3 Bowls of water

3 measuring cylinders filled with water

3 flasks with enzyme

3 Spoons of sugar

Tube + thing to insert the tube through

Electric Heater(s)

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

Method: heat 2 bowls of water to different temperatures (37 degrees and 70 degrees), leave one at room temperature, put the enzyme flask in the different waters, and then connect it via a tube into a flask from underwater, and allow the reaction to take place and displace the water in the tube. Finally observe results and write them down.

6) Safety, Ethical and Environmental issues

Be careful with the flame as a chemical may be flammable

Just incase follow common lab safety precautions such as gloves and safety goggles however you will most likely not need them.

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.

| | <u>Qualitative Data</u> | | |
|----------------------------|--|--|---|
| <u>Temp. (degrees C)</u> | <u>25</u> | <u>37</u> | <u>70</u> |
| <u>Biological Material</u> | <u>The enzyme is active but not at the optimum temperature</u> | <u>The enzyme is at the optimum temperature and is very active</u> | <u>The enzyme is not too active and has denatured</u> |
| | | | |
| | | | |

Commented [M2]: The way you have arranged the information in the table is wrong

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

Different volumes of oxygen produced at different temperatures

| | Volume of Oxygen (ml ²) | | | |
|-----------|-------------------------------------|---------|---------|-----------|
| Temp. (C) | Trial 1 | Trial 2 | Trial 3 | EXTRA ROW |
| 25 | 20 | 21 | 20 | EXTRA ROW |
| 37 | 63 | 61 | 65 | EXTRA ROW |
| 70 | 5 | 3 | 0 | EXTRA ROW |

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

Different rate of reactions at different temperature

| | Rate of Reaction (Volume of Oxygen produced per min) | | | |
|-----------|--|---------|---------|------------|
| Temp. (C) | Trial 1 | Trial 2 | Trial 3 | Average |
| 25 | 20 | 21 | 20 | 20.3333. |
| 37 | 63 | 61 | 65 | 63 |
| 70 | 5 | 3 | 0 | 2.6666666. |

The data processing serves the purpose of giving us the average rate of oxygen produced per min during the experiment, otherwise known as the rate of reaction. This information is very useful.