



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

### 1) Writing a fully focused research question

What is the effect of changing the temperature (25,37,70) on the activity of the catalase enzyme measured by the amount of volume produced?

Commented [M1]: Volume of what ? and what is the measuring unit

### 2) Scientific background

Temperature is a measure of how hot or cold something is expressed in terms of several scales, including Fahrenheit and Celsius. The direction in which heat energy will spontaneously flow is indicated by temperature. The molecules in a gas move more slowly as it cools, and the gas contracts, or exerts less pressure. In other words, if the pressure remains constant, the volume of a gas increases as the temperature rises. Charles's Law indicates the relationship between the volume of a gas and its temperature. When a chemical reaction produces a gas, it is displaced with water or pushes the syringe, and the volume of the gas is usually measured with a gas syringe or an upside-down measuring cylinder.

*Measuring the rate where a precipitate forms - Rates of reaction - GCSE Chemistry (Single Science) Revision - WJEC - BBC Bitesize. (n.d.). BBC Bitesize.*  
<https://www.bbc.co.uk/bitesize/guides/z6bj2nb/revision/3>

<https://www.hoodriver.k12.or.us/cms/lib06/OR01000849/Centricity/Domain/1199/Charles%20Law%20Lab.pdf>

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**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 volume of gas will change

Citations/References:

### Scientific explanation for hypothesis

When a container of confined gas is heated, the molecules gain kinetic energy and push the movable piston outward, causing the volume to increase. As the temperature rises, the kinetic energy of the gas molecules increases. They strike the container's surface with greater force.

If the container has the ability to expand, the volume will increase until the pressure returns to its original value.

*What happens to the volume of gas as the temperature of a gas increase at a constant pressure? | Socratic.* (2014, June 24). Socratic.org. <https://socratic.org/questions/what-happens-to-the-volume-of-gas-as-the-temperature-of-a-gas-increase-at-a-cons>

*11.5: Charles's Law- Volume and Temperature.* (2016, April 4). Chemistry LibreTexts. [https://chem.libretexts.org/Bookshelves/Introductory\\_Chemistry/Introductory\\_Chemistry/11%3A\\_Gases/11.05%3A\\_Charless\\_Law-\\_Volume\\_and\\_Temperature](https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry/11%3A_Gases/11.05%3A_Charless_Law-_Volume_and_Temperature)

Because:

#### **4) Manipulating the variables:**

**What is your independent variable?** temperature

- What are the units? Celsius
- How will it be changed stating the instruments that you will be using? By using a water bath, you can alter the temperature
- Will you be doing a control experiment? yes
- Why did you choose this range? at higher temperatures enzymes are denatured.

Commented [M2]: Write the answers in a paragraph

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

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?
Amount of water	By using a graduated cylinder, we can add the same amount of water to each experiment to make sure it doesn't affect anything.	If not controlled, they may influence the results and give inaccurate results, which will cause the experiment to be unfair.
Amount of catalase enzyme	By using a graduated cylinder, we can add the same amount of water to each experiment to make sure it doesn't affect anything	If not controlled, they may influence the results and give inaccurate results, which will cause the experiment to be unfair.
Amount of hydrogen peroxide	By using a graduated cylinder, we can add the same amount of water to each experiment to make sure it doesn't affect anything	If not controlled, they may influence the results and give inaccurate results, which will cause the experiment to be unfair.

Commented [M3]: More details the 3<sup>rd</sup> column

## 5) Materials and Method:

Material:

Balance to measure yeast

Boiling tubes

Graduated cylinder to measure vol of hydrogen peroxide

Marker to label boiling tubes

Water bath

Thermometer  
Stop watch  
Inverted Measuring cylinder  
Tube

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

1. Measure 3 0.2g samples of yeast powder
2. Measure 10 ml of hydrogen peroxide into 3 separate boiling tubes
3. Label each tube; 37°C, 27°C, and 70°C and put each boiling tube into a water bath for 5 minutes. Check the temperature with a thermometer.
4. Set up the inverted measuring cylinder.
5. Add the yeast to the first boiling tube and quickly connect the tube to the rest of the apparatus.
6. After just 10 seconds, record the volume of oxygen
7. Repeat for each of the 3 temperatures of hydrogen peroxide.

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

Safety: use gloves  
Ethical: no animals were used

**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.**

Commented [M4]: Qualitative data

Temperature °C	Observation
25	A good amount of gas was produced, it produced more than 70°C but less than 37°C. you could clearly see the gas being displaced.
37	Most gas was produced at this temperature and it was displaced by a lot and you can see a huge amount of space compared to the other temperatures.

70	Not a lot of gas was produced, least amount. You could barely see any change.
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**Raw Data**

Volume of oxygen ml

Temp °C	Trial 1	Trial 2	Trial 3
25	20	21	20
37	63	61	65
70	5	3	0

Commented [M5]: Temperature and volume in the same row

**Processed data**

Rate of reaction

Temp °C	Trial 1	Trial 2	Trial 3	Average
25	20	21	20	20.33
37	63	61	65	63
70	5	3	0	2.67

Commented [M6]: Temperature and the rate in the same row

