

Watch the PowerPoint presentation and copy the notes.

When finished, assemble in a lab group of 2 students and begin planning your experiment.

A rough overview of your experiment is due at the end of class that includes:

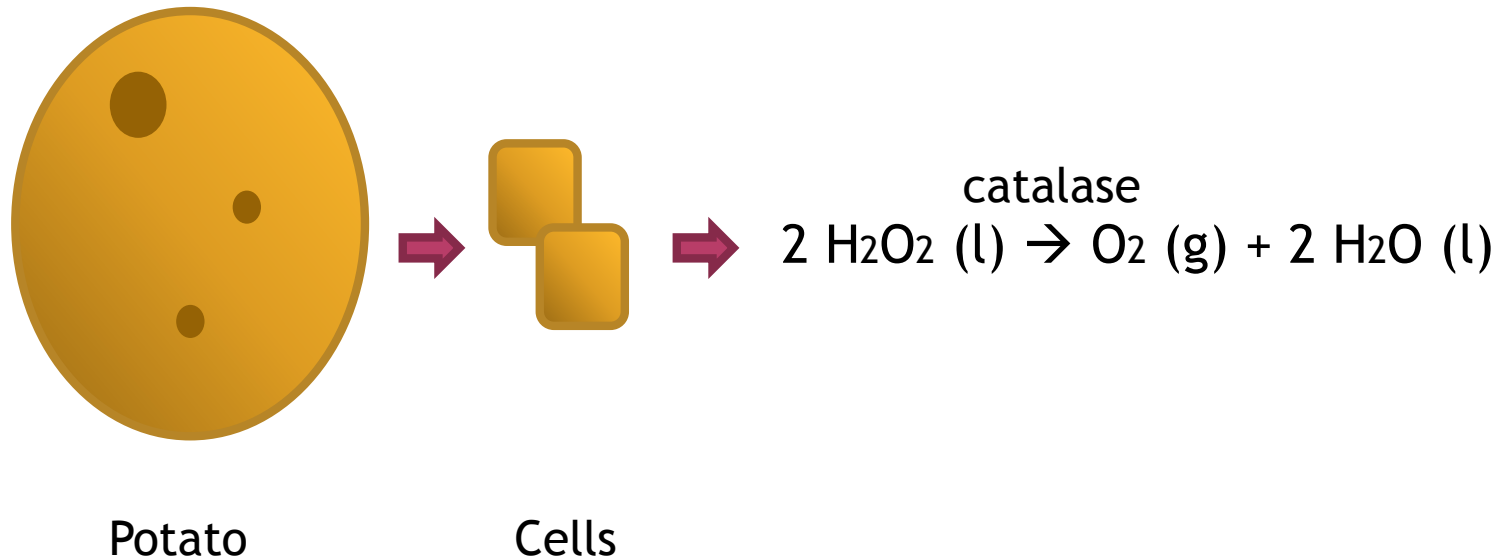
- HYPOTHESIS
- LIST OF MATERIALS
- PROCEDURE

# ENZYME INQUIRY LAB

## BACKGROUND INFORMATION

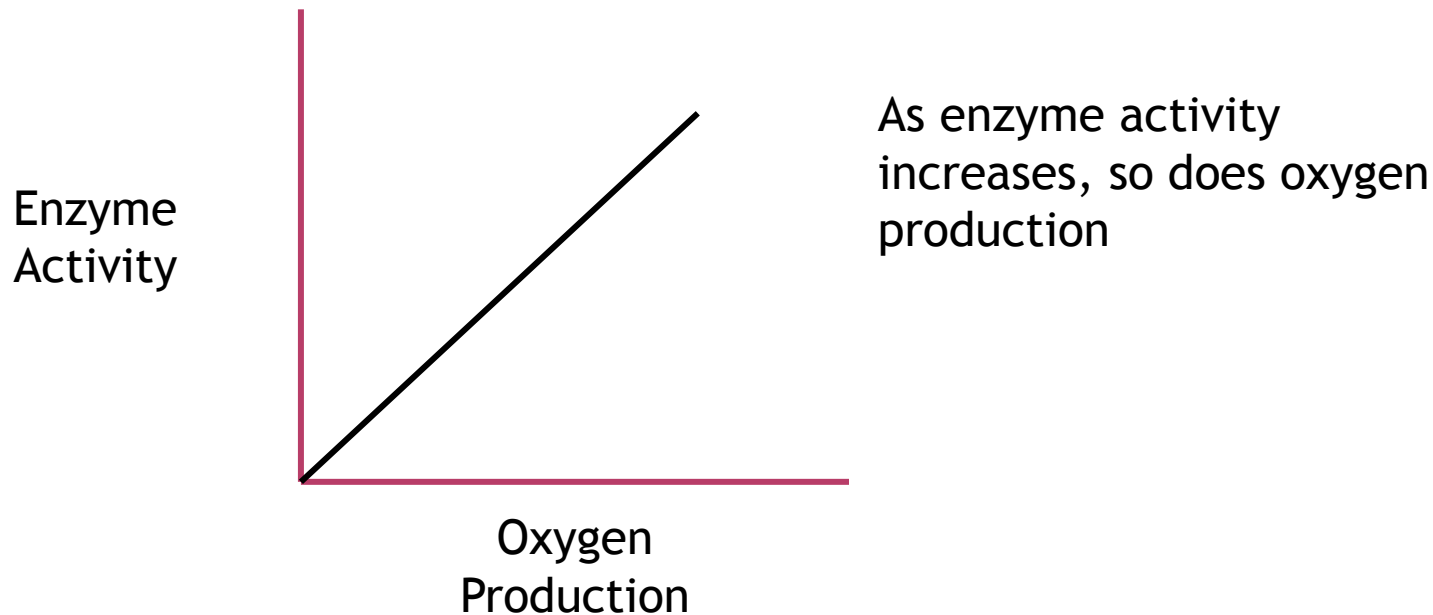
Inside the cells of a potato is an enzyme called “catalase”.

This enzyme breaks down **hydrogen peroxide** ( $\text{H}_2\text{O}_2$ ) and produces **oxygen gas** and **water**.



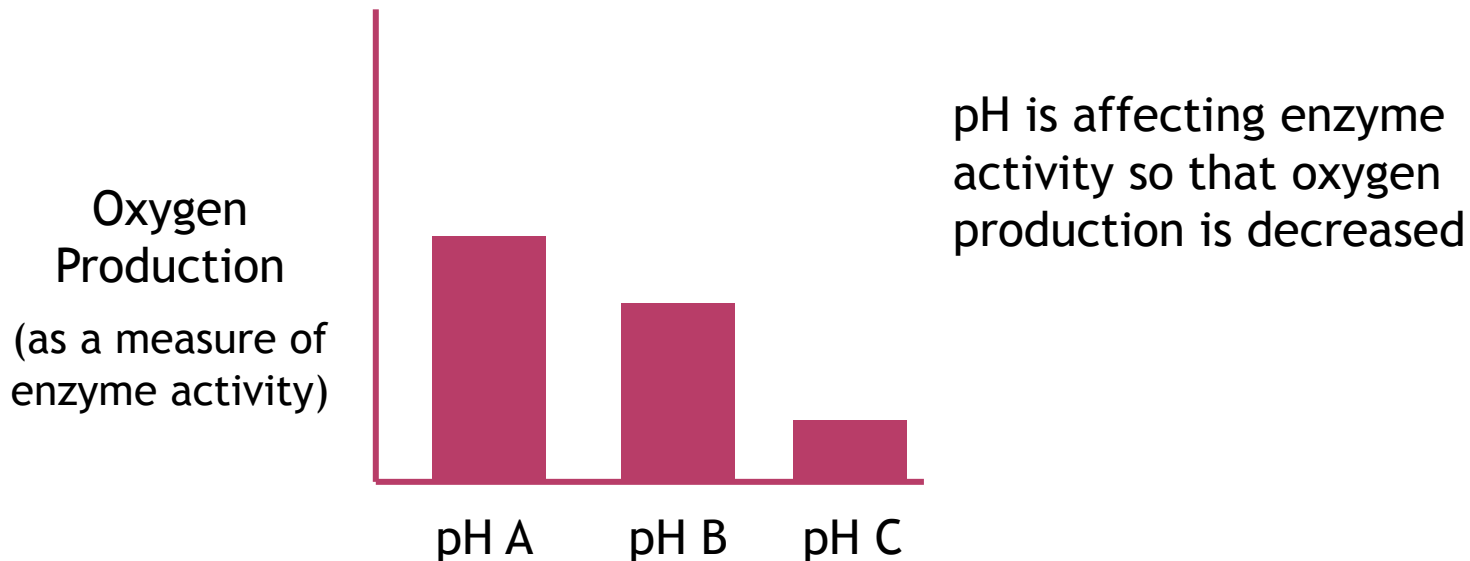
The more active the enzyme, the more **oxygen** (and water) it produces.

We can use the **rate of production of oxygen** as a measure of enzyme activity. And we can determine the relative influence of varying **different factors on enzyme activity**.



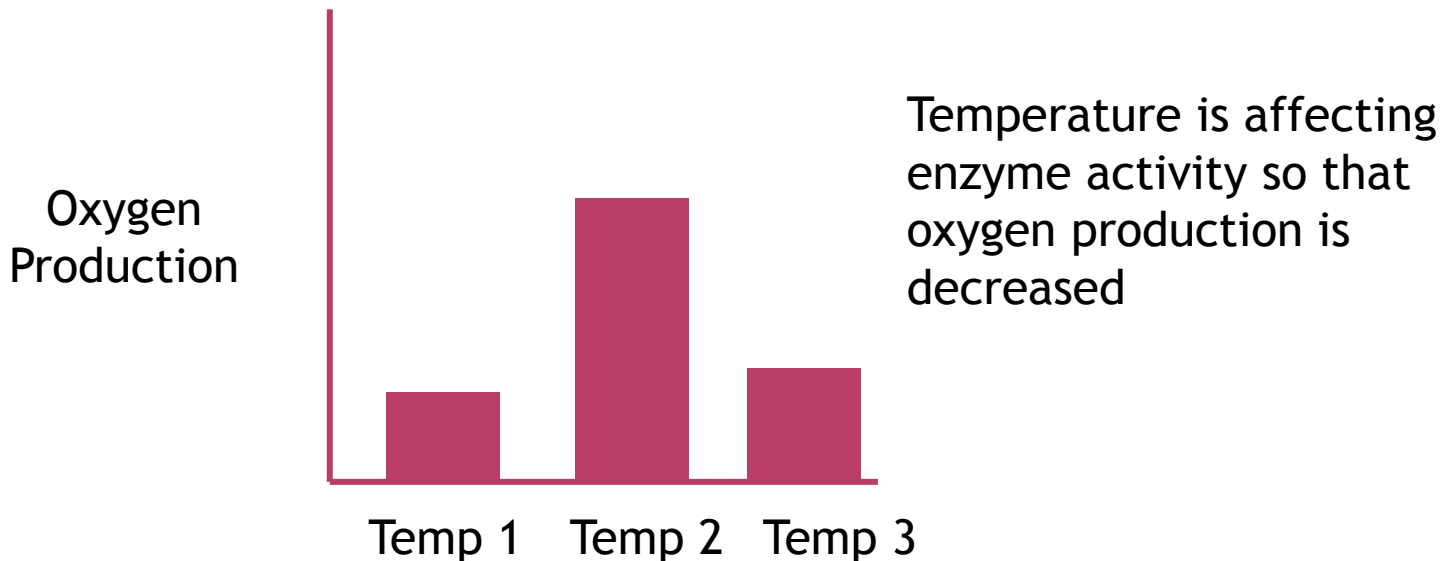
Since enzymes are proteins, enzyme activity is affected by changes in pH (measure of acidity).

If the pH changes are too drastic, enzymes can become **denatured** and their activity is reduced or abolished.



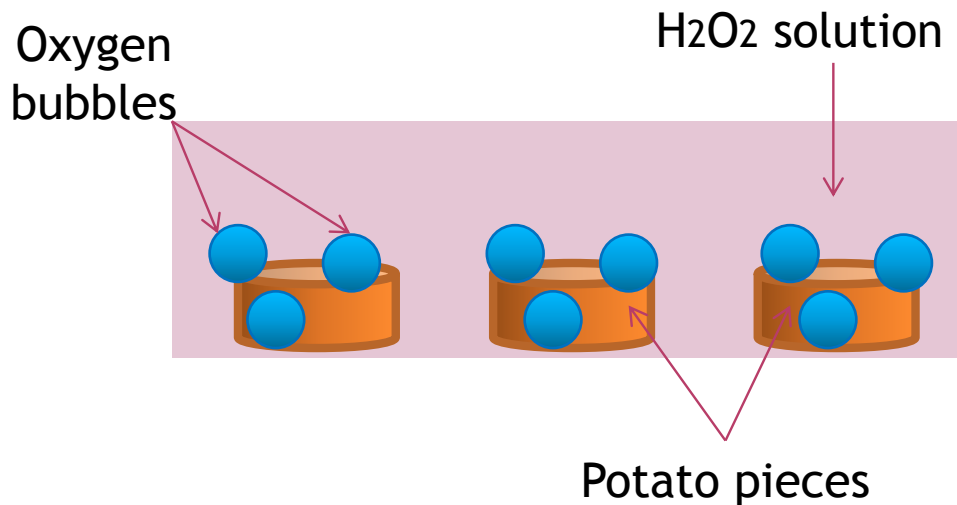
Enzyme activity may also be adversely affected by changes in **temperature**.

Normally, enzymes work at a particular **temperature optimum** and if the temperature is either too high or too low, the enzyme activity is reduced.



Enzyme activity can also be affected by **surface area**, ie. the more enzyme exposed to substrate or the more substrate exposed to enzyme.

For example, if potato cells are crushed or cut into smaller pieces, this may affect how much catalase enzyme comes into contact with substrate ( $\text{H}_2\text{O}_2$ ).



The more bubbles, the more oxygen. Therefore, the more active the enzyme.

## THE EXPERIMENT

You and your lab partner will design an experimental procedure based on what you would like to study.

Decide what **independent variable** (ie. pH, temperature, surface area, etc.) you want to manipulate to determine its effect on enzyme activity.

Your **dependent variable** is the rate or amount of oxygen production and you will need a number of **controlled variables**.

Use **3 different changes** to your independent variable (ie. neutral pH, acidic pH, basic pH).

Consider the **materials** you will need to perform the experiment. You will have access to standard laboratory equipment including:

- Potatoes, scalpels, forceps
- Hydrogen peroxide solution
- Acid, base, water
- Hot plate, thermometer
- Beakers, test tubes, graduated cylinders, droppers, retort stand, clamp
- A few other select items may be available

Only typical lab equipment available. Any additional materials must be provided by student.



# LAB FORMAT

## Hypothesis:

Create an IF / THEN statement about your experiment.

Materials: List of items.

## Procedure:

- Past tense, impersonal, numbered steps which describes experiment and includes all materials used.

## Observations:

- Record data on oxygen production in a well-designed and titled **data table**.
- Present data in a well-designed and titled computer-generated **graph**.

## Conclusions:

1. Describe your independent, dependent and controlled variables.
2. Explain how changing your independent variable influenced the enzyme activity and explain why.
3. List and explain at least three possible experimental sources of error in this lab activity.

## NOW DO THIS

Assemble in a lab group of 2 students and work on designing your experiment. Consider what your variables will be and what materials you need to conduct the experiment.

You will only have access to typical lab materials. Feel free to look around the room on shelves and lab drawers to determine some of the items available.

Submit at end of class with your names:

- **Hypothesis, Materials, Procedure**