

Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

LESSON PLAN

LESSON TOPIC:

Enzyme activity

- 1: Enzyme Structure and Binding specificity.
- 2: The Effects of Temperature and PH on Enzyme Activity
- 3: The Effects of Biotic and Abiotic Factors on Enzyme Function

STANDARD(S) & INDICATOR(S):

- 5.1.12.D.2. Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
- 5.3.12.A.2. Demonstrate the properties and functions of enzymes by designing and carrying out an experiment.
- 5.3.12.A.3. Predict a cell's response in a given set of environmental conditions.

OBJECTIVE(S): Students will be able to:

- Determine the rate at which the enzyme catalase converts substrate to product.
- Design a series of activities that examine the enzymes function in multiple conditions, such as temperature and PH changes.
- Design a plan for collecting data to show that all biological systems are affected by complex biotic and abiotic interactions.
- Analyze data to identify how molecular interactions affect structure and function.

MATERIALS:

- 6 Test tubes and Test tube holder
- 10-ml Graduated cylinder
- 40 ml 3% Hydrogen peroxide solution
- Straight-edged razor blade
- Scissors and Forceps (tweezers)
- Thermometer; pipettes
- Stirring rod; pH paper
- Fresh liver, chicken meat, Apple, and Potato
- Timer
- Laboratory notebook
- Distilled or deionized water

BACKGROUND INFORMATION:

- Enzymes are biological catalysts.
- Enzymes speed up chemical reactions by lowering activation energy.

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- Enzymes are large protein molecules (polypeptides), folded so that they have very specifically shaped substrate binding sites.
- The optimum reaction condition are different for each enzymes for each enzyme.

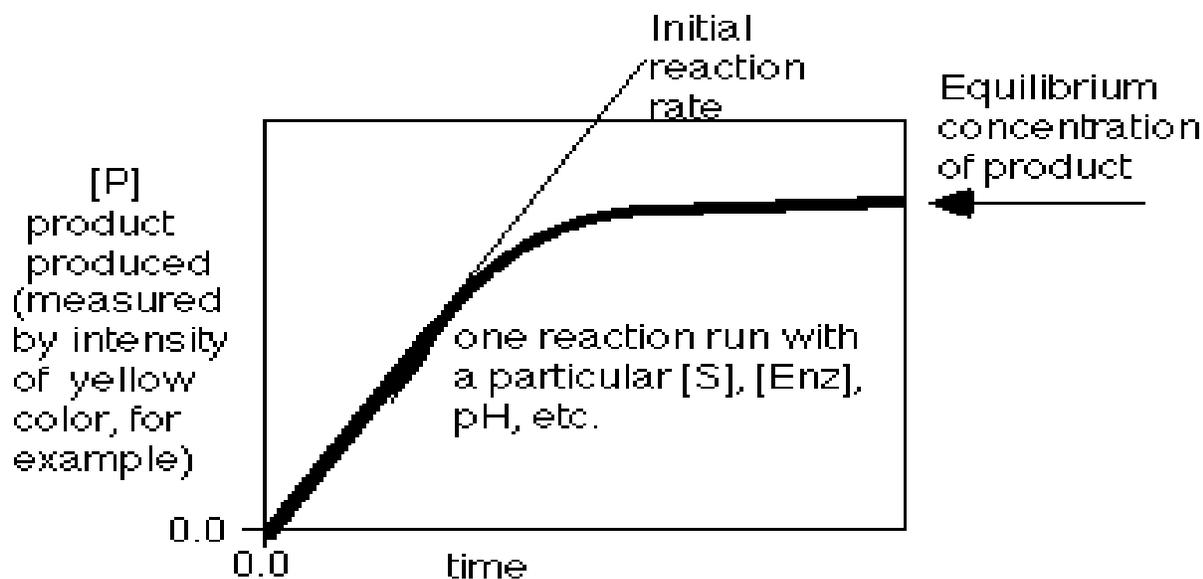
CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS)
including detailed procedures:

- Students will allow catalase to react with hydrogen peroxide for varying amounts of time and then stop the reactions by adding H_2SO_4 .
- Students will use pipettes to measure solutions.
- Students will use pH indicators to determine environmental conditions that may influence the reaction activity of enzymes.

Students will calculate the rate of a reaction by measuring, over time, either the disappearance of substrate or the appearance of product. (simple titration)

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:

- Lab report
- Graphs
- Analysis of results
- Recommendation for future studies
- Formal tests and quizzes



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SUPPLEMENTAL RESOURCES:

- Assay for peroxidase and guaiacol, Faizyme Labotatorie,
<http://faizyme.com/assaperg.htm>
- Kubo, Akihri, Hikan, et al., “Cloning and Sequencing of a cDNA Encoding Ascorbate Peroxidase from *Arabidopsis thaliana*,” *Molecular Biology*, Vol.18, Number 4, 691-701.
<http://www.ncbi.nlm.nih.gov/pubmed/1558944>
<http://www.ncbi.nlm.nih.gov/Class/mimicourses/>

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