



Speedy Cat

Enzymes



K20 Center, Christen Rowland

Published by K20 Center

This work is licensed under a [Creative Commons CC BY-SA 4.0 License](https://creativecommons.org/licenses/by-sa/4.0/)

Grade Level	9th – 12th Grade	Time Frame	2-3 class period(s)
Subject	Science	Duration	150 minutes
Course	Biology		

Essential Question

How do enzymes change the reactions in which they participate?

Summary

In this lesson, students will explore the dynamics of enzymes by investigating what enzymes do, how they work, and in what types of substances they are found. Prior this lesson, students should have developed a good understanding of cell structure, function, and membrane transport.

Snapshot

Engage

Students watch a demonstration of pudding being digested and complete a quickwrite to explain what they think happened.

Explore

Students complete the activity in the attached "Need for Speed: A Look at Enzyme Activity" handout. In groups, students will act as enzymes to discover their specific characteristics.

Explain

Students participate in an I Think/We Think activity to reflect on the the work done for the "Need for Speed: A Look at Enzyme Activity" handout.

Extend

Students participate in the "Gelatin Enzyme Lab," investigating different food substances, identifying which of those foods have enzymes, and determining the enzymes' purposes.

Evaluate

Students summarize their knowledge on enzymes in a song, rap or chant.

Standards

ACT College and Career Readiness Standards - Science (6-12)

- IOD303:** Find basic information in text that describes a complex data presentation
- IOD304:** Determine how the values of variables change as the value of another variable changes in a simple data presentation
- IOD403:** Translate information into a table, graph, or diagram
- IOD404:** Perform a simple interpolation or simple extrapolation using data in a table or graph
- SIN201:** Find basic information in text that describes a simple experiment
- SIN301:** Understand the methods used in a simple experiment
- SIN401:** Understand a simple experimental design
- SIN403:** Identify a control in an experiment
- SIN502:** Predict the results of an additional trial or measurement in an experiment
- SIN503:** Determine the experimental conditions that would produce specified results
- EMI201:** Find basic information in a model (conceptual)
- EMI301:** Identify implications in a model
- EMI401:** Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text
- EMI502:** Determine whether presented information, or new information, supports or contradicts a simple hypothesis or conclusion, and why
- EMI505:** Determine which experimental results or models support or contradict a hypothesis, prediction, or conclusion
- EMI603:** Use new information to make a prediction based on a model

Oklahoma Academic Standards (Physics)

- B.LS1.1:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

Oklahoma Academic Standards (Physics)

- PH.PS4.5 :** Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*

Attachments

- [Gelatin Enzyme Lab - Spanish.docx](#)
- [Gelatin Enzyme Lab - Spanish.pdf](#)
- [Gelatin Enzyme Lab.docx](#)
- [Gelatin Enzyme Lab.pdf](#)
- [NEED FOR SPEED ANALYSIS - Spanish.docx](#)
- [NEED FOR SPEED ANALYSIS - Spanish.pdf](#)
- [NEED FOR SPEED ANALYSIS.docx](#)
- [NEED FOR SPEED ANALYSIS.pdf](#)
- [Need for Speed A Look at Enzyme Activity - Spanish.docx](#)
- [Need for Speed A Look at Enzyme Activity - Spanish.pdf](#)
- [Need for Speed A Look at Enzyme Activity.docx](#)
- [Need for Speed A Look at Enzyme Activity.pdf](#)
- [T-Chart for I Think, We Think - Spanish.docx](#)
- [T-Chart for I Think, We Think - Spanish.pdf](#)
- [T-Chart for I Think, We Think.docx](#)
- [T-Chart for I Think, We Think.pdf](#)

Materials

- Chocolate pudding
- Digestive enzyme capsules

- Marbles
- Tape
- 500 pennies
- Gelatin
- Beaker
- Test tubes
- Test tube rack
- Pipettes
- Stirring rod (or coffee stirs)
- Graduate cylinder
- Boiling water
- Cold water
- Adolph's Tenderizer
- French's Meat Tenderizer
- Fruit juices/pulp

Engage

The teacher should set up the demonstration by making ready two chocolate pudding containers and a digestive enzyme capsule. Digestive enzyme capsules can be easily found at a grocery store or pharmacy. With students observing, the teacher should open one enzyme capsule and mix it into one of the pudding cups, leaving the other pudding cup unaltered. After three-and-a-half minutes, the teacher should show students what has happened to the pudding containing the enzymes and compare it to the pudding cup in which there are no enzymes. At this time, students will complete a quick write on what they think is going on in the pudding. A YouTube example of the demonstration can be found at ["Watch Digestive Enzymes Break Down Chocolate Pudding"](#) (hyperlink). After the demonstration, in groups of two or three, students will discuss their explanations and things they think were going on in the pudding. One spokesperson from each group will then share the results of the discussion with the whole class.

Teacher's Note

As the spokespersons are presenting, it might be an appropriate time to introduce the definitions of the terms "enzyme" and "catalyst."

An enzyme is a biological catalyst that helps accelerate or catalyze a chemical reaction.

A catalyst is a substance that speeds up the rate of a reaction without being consumed.

Explore

Students will participate in the investigation described in the attached "Need for Speed: A Look at Enzyme Activity." Before the activity begins, the students will copy the data table to use for recording their information. Divide students into groups of two or three. Trial one will be done as a whole group. Each group will nominate a person to represent an enzyme. Students will work to pick up pennies and return them to their assigned lab tables as quickly as possible. In trial two, the student who is the "enzyme" will have two fingers taped together. For trial three, the individual who is the "enzyme" must work with a marble taped to the fingers. In these activities, students are to act as if their hands are the enzymes. When the fingers are taped together, it represents what happens during denaturation of an enzyme. When a marble is taped to the fingers, it represents the activity of inhibitors.

Teacher's Note

This might be the most appropriate time to explain that enzymes have a lock and key fit (one type of enzyme for a specific substrate), or a glove and hand fit.

Explain

Students will participate in an [I Think/We Think](#) discussion/reflection over the "Need for Speed: A Look at Enzyme Activity" lab. The teacher should either pass out the attached "T Chart for I Think/We Think" handout, or have students construct a two-column table in their notes. Students will then answer the questions in the attached "Need for Speed Analysis." The teacher should provide time for students to record their thoughts about each question in the "I Think" column. Students will then work in groups of two or three (different from the lab groups) to discuss and write answers in the "We Think" column. Groups will pick a spokesperson and then the teacher should randomly pick different groups to answer each question.

Extend

Students will participate in the investigation described in the attached "Gelatin Enzyme Lab." This lab will take two days to complete because the materials need to sit overnight. Students will be adding various substances to gelatin to see if different common foods and spices contain enzymes and how those enzymes work. When finished, students will reflect on the lab by answering questions about variables and controls and the role of enzymes.

Evaluate

At the end of the lesson, students will work in pairs using the [Chant It, Sing It, Rap It](#) activity to create a performance about enzymes. The teacher should be sure students include how enzymes work, things that may interfere with enzymes, and real examples from their work on the attached "Gelatin Enzyme Lab." Students will then be asked to share their chants, raps or songs with the class.

Teacher's Note

To differentiate, the teacher could also allow students to write poems or use some other creative device that could be shared.

Resources

- Crossroads. (2015, February 19). "Watch digestive enzymes break down chocolate pudding." [Video file]. Retrieved from <https://www.youtube.com/watch?v=hB5fBoegUiQ>
- I Think/We Think: Instructional Strategy: K20 Center. (n.d.). Copyright 2015, Board of Regents of the University of Oklahoma. Retrieved from <https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5065bfd>
- Chant It, Sing It, Rap It Instructional Strategy: K20 Center. (n.d.). Copyright 2015, Board of Regents of the University of Oklahoma. Retrieved from <https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5066ebf>
- Massengale's Biology Junction. (n.d.) "Enzyme lab one: What form of pineapple juice contains enzymes that digest protein?" Retrieved from www.biologyjunction.com/10sPineappleEnzymeLab.doc