

Activity 3.2.1: What Are Action Molecules?

Introduction

Chemical reactions are essential for life and occur in all living tissues. Regulating homeostasis depends upon properly maintaining these reactions. *Enzymes* are an important component for that maintenance. Enzymes are a type of protein called *catalysts*. A catalyst facilitates or helps a reaction to occur more readily by reducing the energy required for the reaction to occur. The catalyst is not part of the actual reaction, does not change the chemical reaction, and is not permanently altered by reaction. It does however facilitate the reaction and can be used over and over again.

Most chemical reactions in the body are dependent upon enzymes. Enzymes are highly specific and work on only one substance called its *substrate*. In this activity, you will learn why enzymes are specific for a particular substrate.

Equipment

* Computer with Internet access and Inspiration
* Laboratory journal
* A variety of model building materials which may include:
* Styrofoam, balls or sheets
* Knife to cut the Styrofoam
* Pipe cleaners
* Colored construction paper
* Glue
* Tape
* Clay or play dough
* Markers

Procedure

Part A: Research

1. Use the Internet or other resources to research the following information about enzymes.
* Definition of enzyme
* Definition of substrate
* Importance of enzymes
* How enzymes are named
* Where enzymes are made
* Basics of the Lock and Key model of enzyme action
* Basics of the Induced Fit model of enzyme action
* Active Sites
1. Take detailed notes in your laboratory journal with information related to each bullet.
2. Create a concept map about enzymes using Inspiration software. Use the information in your notes to construct the map. Remember, concept maps have connecting words on the arrows describing the relationships (links) between the terms in the symbols.

Part B: The Model

During the research in Part A, you learned about the Lock and Key Model and the Induced Fit Model of enzyme function. Part B will require you to apply this knowledge.

1. Design a 3-D model that illustrates both models of enzyme function. The model you design should demonstrate both the Lock and Key and the Induced Fit explanations of enzyme interaction with substrate. Your model can use any of the materials supplied by your teacher and you may use additional supplies that you provide.
2. Prepare a 2 to 3 minute oral presentation describing how your model demonstrates both possible explanations of how enzymes interact with substrates.
3. Present your model to the class. Be sure all members of the group are involved in the presentation and that you clearly show your understanding of the difference between Lock and Key and Induced Fit models of enzyme function. Your model and explanation must answer the question: “How can enzymes be so specific in terms of the substrate they impact?”
4. Do not disassemble your model.

Part C. Co-enzymes

1. Another aspect of enzyme function involves organic molecules called *co-enzymes*. These molecules are an important part of your diet.
2. Use the Internet to research co-enzymes. Use the bullets below to guide your research. Take notes on each bullet.
* Describe the function of co-enzymes.
* Identify three different co-enzymes.
* Identify foods that are good sources of these co-enzymes.
1. Return to the concept map you made about enzymes and expand it to include co-enzymes.
2. Return to your 3-D model and expand it to include a co-enzyme.
3. When directed by the teacher, share your model with another group and explain the modification made to include the co-enzyme.

Conclusion

1. Why do enzymes only work on their specific substrates?
2. What would happen if there were no enzymes in the human body? Explain your answer.
3. Why is it important to eat a balanced diet containing essential vitamins?