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Enzyme Substrate Specificity Kit

This worksheet is to be used with the online activity Substrate Specificity which can be found at: <https://cbm.msoe.edu/modelingResources/molecularExplorations/substrateSpecificity.html>.

Assemble the Substrate

1. Draw and label your substrate with the appropriate colors/chemical properties.

Assemble the Enzyme

2. What does the toober represent?
3. What do the clips on the toober represent?
4. For each clip, choose a specific amino acid that has the same chemical properties as the clip. List the color of the clip and the amino acid that clip represents for each of the clips on your protein.
 - a. Yellow
 - b. Yellow
 - c. Red
 - d. Blue
 - e. White

Forming the Enzyme-Substrate Complex

5. What color ball (functional group) should match with the yellow clip?
6. What color ball (functional group) should match with the white clip?
7. What color ball (functional group) should match with the red clip?
8. What color ball (functional group) should match with the blue clip?

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Impact of Substrate Bond Rotation on Binding

9. Describe how well the substrate binds in the active site after rotating the bond.
10. What is the purpose of holding the substrate in a specific conformation?

Impact of Mutation on Substrate Binding

11. What is the effect of the loss of one of the active site side chains on the strength of the binding of the enzyme to the substrate?

Stereochemical Specificity of Enzymes

12. Draw the enantiomer that you made.
13. Draw the enantiomer bound to the enzyme.
14. Was your enzyme stereospecific or not? Explain.

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Absolute Specificity of Enzymes

15. Draw your substrate and the one that you borrowed.

16. Draw the borrowed substrate in your active site.

17. Describe the results.

Examining the Active Site of Real Enzymes

18. What types of interactions do you see between glutamate dehydrogenase and its substrate glutamate?

19. What types of interactions do you see between hexokinase and its substrate glucose?

Reflection

20. What new information have you discovered by using this model?

21. What have you learned or clarified with this activity?

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