

CHAPTER 05

ENZYMES

The stuff you need to know in this chapter:

Core:

- Define the term catalyst as a substance that increases the rate of a chemical reaction and is not changed by the reaction
- Define enzymes as proteins that function as biological catalysts
- Describe why enzymes are important in all living organisms in terms of reaction speed necessary to sustain life
- Describe enzyme action with reference to the complementary shape of an enzyme and its substrate and the formation of a product (knowledge of the term active site is not required)
- Investigate and describe the effect of changes in temperature and pH on enzyme activity
- Investigate and describe the use of biological washing powders that contain enzymes

Extended:

- Explain enzyme action with reference to the active site, enzyme-substrate complex, substrate and product
- Explain the specificity of enzymes in terms of the complementary shape and fit of the active site with the substrate
- Explain the effect of changes in temperature on enzyme activity in terms of kinetic energy, shape and fit, frequency of effective collisions and denaturation
- Explain the effect of changes in pH on enzyme activity in terms of shape and fit and denaturation



How enzymes work

1. Define "enzyme"

2. Define "catalyst"

3. Many reactions in living organisms could happen even if enzymes weren't there. Despite this, organisms couldn't live without enzymes. Explain why they are essential to life.

4. Draw a diagram to explain the "lock and key" mechanism by which enzymes function.

In your diagram label the following:

enzyme, substrate, enzyme-substrate complex, product, active site



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5. In terms shape, explain why a specific enzyme is needed for a specific substrate

6. State why enzymes are useful in soap powders for washing clothes.

7. State the name of the enzymes present in biological washing powders that break down the following food materials:

Food molecule	Type of enzyme
Protein	
Starch	
Lipids	



Rates of enzyme reactions

1. Describe how the movements of molecules change as temperature increases. Use the subheadings to help

Effect of increasing temperature on speed of movement

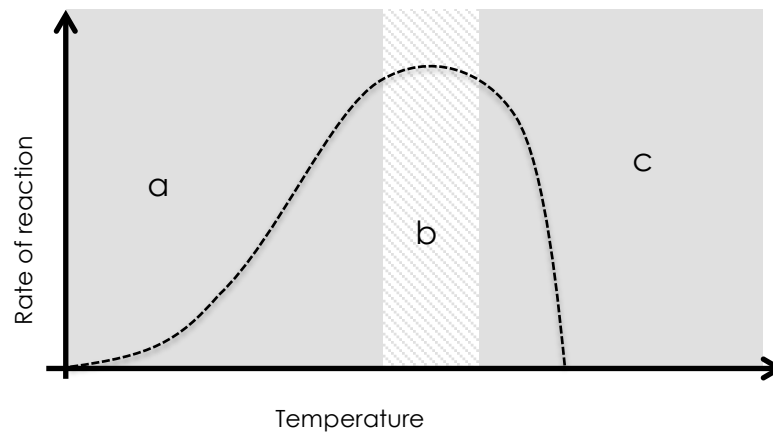
Effect of increasing temperature on number of collisions

2. State how an increase in temperature affects the number of collisions of a substrate with the active site of an enzyme



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3. Look at the graph below. Explain the trend at each point.



	Explanation of trend
A	
B	
C	

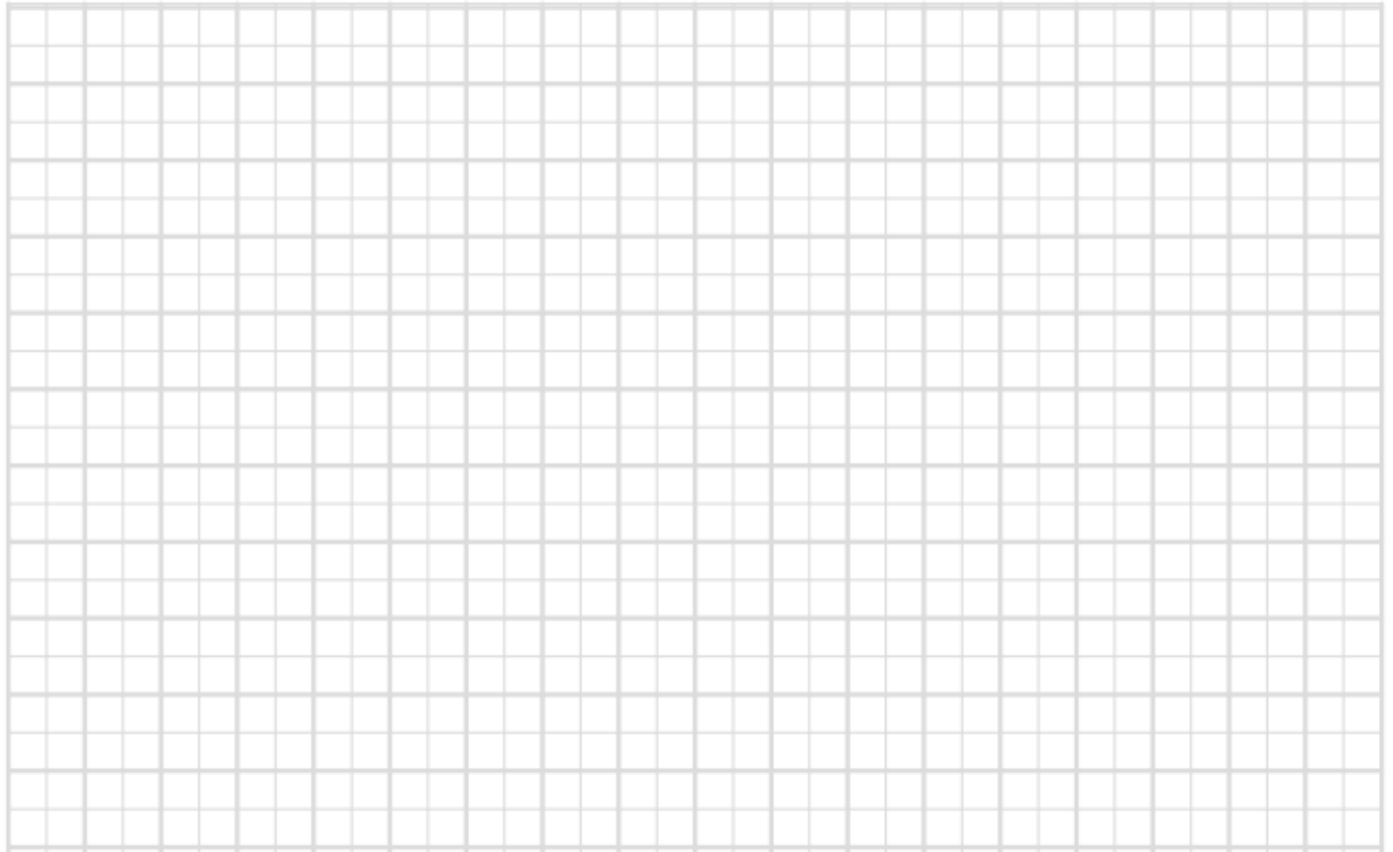
4. The peak of the graph shows the temperature at which the rate of reaction is fastest. What phrase describes this temperature for this particular enzyme?



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5. Draw a graph to show the change in rate of an enzyme catalyzed reaction as pH changes. Assume that the optimum pH for the enzyme is 7.

Remember the rules for graph drawing!



6. Students sometimes say that enzymes are "killed" by high temperatures or a certain pH. What word is better? Explain why.

