Name: _____ K: _____/8 T: _____/10 C: _____/9 A: _____/9

STEM Cases™

Student Guide: Enzymes

Introduction: Claire, a Great Dane, is experiencing extreme weight loss and lethargy despite maintaining a normal appetite. As a veterinary technician, you must learn about metabolism, digestion, and enzymes to help Claire. As part of this Gizmo, you will examine Claire, run lab tests, and analyze data to determine the cause and treat her weight loss.

Vocabulary: As new vocabulary is introduced, the words are presented in the Gizmo as **orange text** - clicking the orange text opens the glossary page for that term. You can use the glossary at any point. **Rephrase answers in your own words to avoid plagiarism!**

1. Launch the Gizmo and follow the instructions provided to collect data on Claire. The questions below are sequential. **Look under Case -> Patient info**

2. What are Claire's symptoms? **[C: 3]**

3. Define "metabolism" **Rephrase in your own words. [K: 1]**

4. **Metabolism** is a combination of two types of reactions. What are these? Define them. **[K: 2]**
Hint: Click on Handbook -> Metabolism, then follow the triangular arrow at the bottom right corner of the simulation window (beside Glossary).

type of reaction	definition

5. What type of reaction is given in the "Chemical Reactions" example? **[A: 1]**

6. The reaction rate is the amount of product produced in a specific time. Why is reaction rate important for biological organisms? **[A: 1]**

7. "Enzymes are biological **catalysts**". What does this mean? **[K: 1]**

8. Every chemical reaction, including the reactions that happen inside a living organism, requires an initial input of energy. The energy needed to start a chemical reaction is called the **[C: 1]**

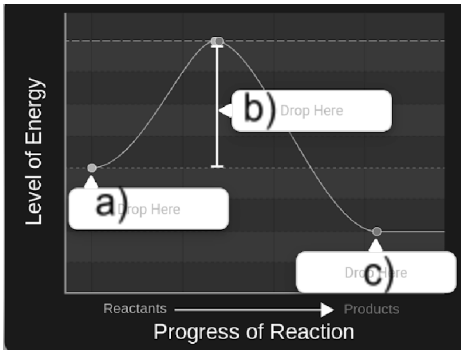
9. Several different types of energy can be used to "give" a reaction its activation energy. List these below: **[C: 2]**

thermal
collision

10. In biological organisms thermal energy cannot be easily added to start a reaction. Instead, enzymes are used. Explain HOW enzymes speed up the rate of a reaction. **[T: 2]**

11. Label the reaction graph provided with the following labels: **activation energy, reactant energy, produce energy. [C: 3]**

a)	
b)	
c)	



12. Fill in the blank:

Enzymes do not change the energy of the reactants or the products. They speed up a reaction by lowering the energy of…. **[K: 1]**

13. Each of your 80 000 enzymes has its own highly specific shape, its **structure**. What determines the structure of an enzyme? **[A: 1]**

14. Because of their specific structure, enzymes differ from each other. Every enzyme has a different **active site.** What happens at the active site of an enzyme? Can the **substrate** of one enzyme fit into the active site of another? **[A: 2]**

15. How do high temperature and pH changes affect the workings of an enzyme? Explain. **[T: 2]**

16. Once you are back to Claire's Lab Data, fill in the table below: **[K: 3]**

enzyme	location	function
pepsin		
protease		
carbohydrase		
lipase		

17. Low enzyme function can be caused by a range of issues. In your Gizmo, explain how each of these could affect enzyme function and what happens when you test these in Claire. **[T: 3]**

Potential issue	explanation	Claire's results
active site mutation		
abnormal pH		
low enzyme production		

18. Science function by asking and testing questions. As more information becomes known new questions can be asked and hypotheses can be revised to make them more and more accurate. At some point, once enough information has been gathered, a conclusion can be made. Explain how this Gizmo illustrates that process. **[T: 3]**

19.

As more evidence gathers, science is replaced by better science. Use a real-life example to explain this. As a good starting point, **have a look at:**
https://www.sciencenews.org/article/coronavirus-covid-19-pandemic-six-months-what-we-know **[A: 4]**