

Enzymes & Substrates

HS_ LS1-6: Construct and revise an explanation based on evidence for the role of enzymes in life processes.

HS – LS1-6: Analyze data to determine the factors that influence enzyme activity.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p>Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.</p> <p>Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</p>	<p>LS1.C: Organization for Matter and Energy Flow in Organisms</p> <p>The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.</p> <p>As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.</p>	<p>Energy and Matter</p> <p>Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.</p>

Day 1

TIME	TASK	DESCRIPTION	NEEDS
10 min	Sticky Discussion	Directions: Take a look at the picture. There are two scenarios here. First there is the picture of Ana. Ana grew 4" over the summer. Second, is Matt. Matt loves ice-cream, and discovered that he gets sick every time he eats ice cream. Take 3 stickies. Offer one reason they are both experiencing these changes. Do not put your name on the stickies	Each student will need 3 stickies and a pen/pencil.
5 min	Sticky Exchange	Directions: working in small groups, stack all of your stickies in a pile. Exchange your stickies with another group.	Have stickies prepared
15 min	The Wall of Ideas	Directions: Every student will have 3 new stickies they did not create. Working quickly, every student will read a sticky aloud and position them on the board in groups. The goal is to hear EVERY idea and to sort them by group.	Have slides prepared
10 min	Video Introduction	Directions: To clarify our understanding of Enzyme and activation energy, we will watch (LINK)	

		the video and work with a partner to answer the questions. Add your question to the google slide.	
10 min	Application	Directions: Working with a partner, share your ideas on how Protease Enzymes, Lipase Enzymes, and Carbohydrase Enzymes impact our body. Work with your partner to conduct a google search to define them and identify one example.	Have slides
15 min	Translate	Directions: We will share what each group came up with. Use a Chat GPT or Claude to come with the explanations of (1) Lipase, (2) Carbohydrase, & (3) Protease. Share a simple explanation	

Day 2

TIME	TASK	DESCRIPTION	NEEDS
5 min	Introduce Enzyme Comic Think, Pair, Share	Directions: You will work in 5 groups to learn a key component of the Enzyme process. Each group will learn 1 topic and will teach the entire class. Group 1: How Enzymes, Substrates, Activation Sites & ending with “ase” Group 2: Activation Energy & reusable products Group 3: The Lock & Key Model Group 4: 3 types of digestive enzymes (lipase, Carbohydrase, & protease) Group 5: How factors like heat, temperature and inhibitors impact enzymes	Have slide ready and handout prepared
10 min	Learn	Each group will learn the concept and prepare to teach them to the students. (2) Video + Comic	Have text ready
15 min	Teach	Directions: Each group will have a member form groups (1-5). Using the comic handout, students will update their comic with correct information.	Have slide ready
15 min	Teacher Lecture & Edit	The teacher will use the lecture notes to teach the 5 concepts. Compare your notes to the teacher's to make sure you have accurate content.	Have slides ready
20 min	Quick Read	Directions: Students will read a short text about Enzyme interactions and will produce summary notes	Have Text embedded in handout
10 min	Questions & Answer	We will ask questions of the teacher.	

Day 3

TIME	TASK	DESCRIPTION	NEEDS
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5 min	Microscope Review	Directions: You will watch a brief video to review how to use your microscope	Have the video embedded in the slide
10 min	Working Pairs	Prepare your microscope and your application for the	Have a slide prepared
40min	Laboratory	Directions: work with a partner to complete the steps of the laboratory. Be sure to have a conversation with the learning app and to see every aspect of the microscopic experimentation.	Have 20 3D printed Labs Have lab protocol in lab
15 min	Debrief	Directions: Working with your partner answer the following questions: (1) What evidence from the laboratory proved the relationship between enzymes and the rate of reaction? (2) How did the shape of the enzymes and substrate impact the interactions. (3) What factors changed the outcome of the experiences.	Have the questions in a google form
20 min	Quick Read	Directions: Students will read a short text about Enzyme interactions and will produce summary notes	Embed text in the handout