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| <h1>ENZYMES</h1> | <p>Proteins that catalyzes chemical reactions for organisms</p> |
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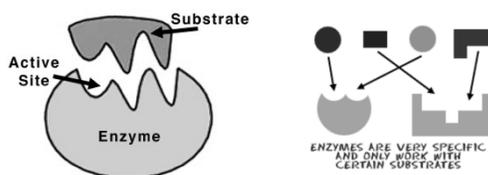
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| <h2>PROTEINS - A REVIEW</h2> |
| <ul style="list-style-type: none"> ▪ What are some functions of proteins? ▪ What is the monomer of a protein? ▪ What is the structure of a protein? ▪ What does -ase mean? (Latin and Greek!) ▪ The order of amino acids is important! Consider this: <ul style="list-style-type: none"> ▪ Grandma and I ate dinner for my birthday. ▪ And for my birthday dinner I ate grandma. |

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| <h2>ENZYMES DO WHAT JOBS IN OUR BODIES?</h2> |
| <p>Enzymes are more important than food, water, or air!</p> <p>Why?</p> <p>Without enzymes, you wouldn't be able to breathe or use the water you drink or food you eat.</p> <ul style="list-style-type: none"> - Digest our food - Help make new cells - Maintain/repair tissues (skin, bones, muscle, etc) |

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| <h2>EXAMPLES OF ENZYMES</h2> |
| <ul style="list-style-type: none"> ▪ Cleaners ▪ Cheesemaking ▪ Proteases, lipases, carbohydrases... |
|  |
|    |

HOW DO ENZYMES WORK?

http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_enzymes_work.html



ENZYMES AS PROTEIN ROBOTS

- Very specific
- Do not react with the substrates
- Do their job over and over again



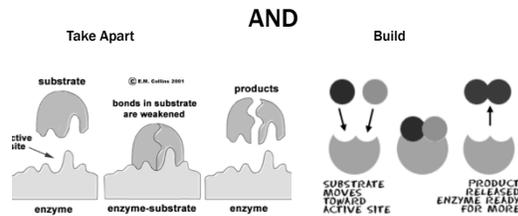
USING CLAY:

- **Enzyme:** Make a basic shaped structure that has an active site. Make it with green clay.
- **Substrates:** Make two other shapes that could fit into the active site. Make it with yellow clay.
- Think previous slide to give yourself ideas.

LABEL...

- The enzyme with "E"
- The substrate with "S"
- The active site with "AS"
- Show how an enzyme works.
- Combine the two substrates to make a product and label it with a "P"
- Can enzymes build, break, or build and break molecules?

DO ENZYMES BUILD OR TAKE APART?



ENZYME VOCABULARY

- **Enzymes:** Protein catalysts found in living things
- **Catalyst:** decreases the energy needed to start a reaction
- **Reactions:** a change in chemical structure
- **Denature:** A change in the shape of an enzyme that makes it useless. The substrate no longer "fits" into the active site.
- **Specific:** Each enzyme does a specific job
- **Substrate:** Each enzyme binds to a **specific reactant**, or substrate
- **Active site:** Where the substrate fits into the enzyme
- **Products:** What the substrate becomes **AFTER** it interacts with an enzyme

PROPERTIES OF ENZYMES

(CLICK ON TITLE FOR ANIMATION)

- Made of **proteins**
- **Speed** up reactions
- Are **specific**
- **NOT used up** during the reaction
- **Reduce** the energy needed for a reaction
- Require specific conditions to work
 - (see next slide)
- They become **denatured** when they are at high temperatures or the wrong pH

FACTORS THAT AFFECT ENZYMES?

- **Temperature**
 - All enzymes have an ideal temperature where they work the best
 - Cold: slower
 - Extreme heat:
 - Denatured - "removal of natural shape"
- **Concentration** (amount in a certain area)
 - More enzymes:
 - faster
 - More substrate: more product and more time to complete reaction
- **pH**
 - All enzymes have an ideal or **optimal** pH where they work the best
 - pH changes can denature the enzyme.



ANIMATION

- http://www.kscience.co.uk/animations/anim_2.htm

MODELING

- Describe an enzyme and the active site
- Show how an enzyme can break down a substrate
- Show how an enzyme can combine two substrates to make one product
- Show how an enzyme is specific to one substrate
- Show how enzyme concentration affects the enzyme reaction
- Show how substrate concentration affects enzyme action.
- Show how changes in pH or temperature affect an enzyme
- Level 4: Show how inhibitors affect enzyme action

TRUE OR FALSE?

- All enzymes work best at a neutral pH

TRUE OR FALSE?

- The names of all enzymes end in -ase

TRUE OR FALSE?

■ **Enzymes are packaged and sold in stores**

TRUE OR FALSE?

■ **Brain cells contain enzymes**

TRUE OR FALSE?

■ **Cooked food is made of cells and therefore contains enzymes.**

TRUE OR FALSE?

■ **The enzymes in cooked food work the same way as enzymes in raw food.**

TRUE OR FALSE

■All cells contain the same enzymes

TRUE OR FALSE

■The human body has an estimated
75,000 *different* enzymes

TRUE OR FALSE

■Enzymes are “used up” during a reaction

TRUE OR FALSE

■Single celled organisms have enzymes

TRUE OR FALSE

Enzymes are living things