Enzymes Review 2015

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| **Essential Knowledge on These Topics:** * All living systems require a constant input of free energy.
* Interactions between molecules affect their structure and function.
* The subcomponents of biological molecules and their sequence determine the properties of that molecule.
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**Concepts You Should be Familiar With:**

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| hydrogen bondingfree energyinhibition feedback inhibition induced fit Gibbs Free Energy (∆G) | metabolism chemical reactionsFirst Law of ThermodynamicsSecond Law of Thermodynamics entropy denaturing (of proteins) |

**Vocabulary You Must Know:**

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| catalystfree energyactivation energyenzymesubstrateproductsreactants endergonic reaction exergonic reaction entropy transition state  | anabolic reactioncatabolic reaction metabolism active site allosteric site competitive inhibition cofactor competitive inhibitor noncompetitive inhibitor (allosteric)enzyme-substrate complex |

**Common Misconceptions Students Have About This Topic:**

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| **Misconception** | **Correct Statement** |
| All enzymes break down substances. | Enzymes merely facilitate chemical reactions. Some of these reactions are catabolic (breaking down substrates into simpler products), while some of these reactions are anabolic (assembling substrates into larger products).  |
| Energy can be created by chemical reactions.  | According to the First Law of Thermodynamics, no. Energy is neither created nor destroyed, it is only converted from one form to another. In living systems, a large majority of energy is lost as heat.  |
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**Math Formulas You Need to Understand, But Not Memorize:**

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| **Calculation of Reaction Rate:** $\frac{dY}{dt}$ **,**  | ***dY* = amount of change, and** ***dt* = change in time**  |

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| **Gibbs Free Energy:** ∆G = ∆H -T∆S | ∆G = change in Gibbs free energy ∆H = change in enthalpy (heat)T = temperature (in Kelvin)∆S = change in entropy  |
| **NOTE: You can always be given a set of data and be asked to find a mean, median or mode of that data set. You could potentially be asked to interpret statistical significance of a set of data (i.e. looking at the standard error of the mean, or the standard deviation).** |

**Past Free Response Questions on This Topic:**

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| **Year** | **Topic**  |
| 2010 | Q2: [Enzyme mediated reaction](http://apcentral.collegeboard.com/apc/public/repository/ap10_frq_biology.pdf) [Scoring Guidelines](http://apcentral.collegeboard.com/apc/public/repository/ap10_biology_scoring_guidelines.pdf) |
| 2005A | Q1: [Respiration in yeasts, effect of temperature on enzymes](http://apcentral.collegeboard.com/apc/public/repository/_ap05_frq_biology_45643.pdf) [Scoring Guidelines](http://apcentral.collegeboard.com/apc/members/repository/_ap05_sg_biology__46627.pdf) |

**Videos You Can Watch:**

Enzymes: <https://youtu.be/ok9esggzN18>

Biological and Polymer Systems: <https://youtu.be/8Stbg8HCOw4>

Life Requires Free Energy: <https://youtu.be/JBmykor-2kU>

Gibbs Free Energy: <https://youtu.be/DPjMPeU5OeM>

Crash Course--Embrace the Chaos! (entropy): <https://youtu.be/ZsY4WcQOrfk>

**Practice Questions You Can Try:**

Learnerator: [Free Energy and Matter](http://www.learnerator.com/ap-biology/q/199/order-in-the-body-systems) (first 28 questions)

Learnerator: [Competition and Cooperation](http://www.learnerator.com/ap-biology/q/210/how-cofactors-work) (questions 1, 2, 13, 15, 27)

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