Name: _____ Block: _____ Date: _____

Biology 12 - Chapter 5 - Enzymes

1. What **advantages** can you see in having **complex metabolic pathways** within body cells to produce various substances, such as amino acids and ATP?
- *more control over reactions (can be halted/modified/sped up/slowed down at any step).*
- *more sophisticated reactions possible, so more complex molecules can be made*
- *intermediate products can be used in other pathways*
- *cyclic pathways/feedback mechanisms possible*

2. What are **enzymes**, and how do they accomplish their functions?
- *proteins that act as biological catalysts. They speed up chemical reactions so they can occur quickly enough at body temp.*
- *Accomplish function by providing docking area for substrates to bind precisely ---> lower activation area for reaction.*

3. How does the "**Lock and Key**" theory of enzyme action differ from the "**Induced Fit**" theory.
- *In Induced Fit model, once the substrate binds the enzyme, the enzyme changes shape to more tightly bind the substrate. In Lock & Key model, E and S fit each other perfectly before they bind.*

4. Why do you think each enzyme has its own **preferred** pH at which it operates?
- *Changes in pH cause conformation changes (denaturing) in proteins (because they disrupt bonds holding the enzyme in its precise shape). Changes in E shape at active site will impair or destroy its substrate-binding ability.*

5. What exactly happens to the structure of an enzyme that has become **denatured**? Describe the **factors** or **processes** that might cause an enzyme to become denatured.
- *The bonds that hold enzyme together become disrupted, causing the Enzyme to lose its precise 3D tertiary structure/quaternary structure.*
- *Factors:*
  1) pH 2) high temperature 3) heavy metals 4) specific chemicals (e.g. HCN)

6. What happens to the **rate of product formation** if you continue to add:
   a) substrate
   P increases until all enzymes saturated
   b) enzyme
   P increases rapidly until substrate used up
   c) an inhibitor
   P formation decreases. If non-revers. inhibitor added, P formation may essentially cease.
   d) heat
   P formation increases until E denatures, at which time it ceases.

7. Discuss, using examples, the effects of **reversible** and **non-reversible inhibitors** on enzyme activity.
- *Reversible inhibitors will slow down enzyme action. The more I that is added, the more the activity slows.*
- *Non-reversible inhibitors will slow down enzyme action. Each inhibitor will destroy an enzyme. If enough I added, E activity will eventually cease. e.g. HCN, Pb++, Hg++, penicillum*

8. Explain, using a labeled diagram, what is meant by **non-competitive inhibition**. Give 2 examples of **non-competitive inhibitors**.
- *see text and notes. examples: Pb++, Hg++, HCN*

9. Using examples, describe and differentiate between the following terms: **coenzyme**, **apoenzyme**
- *Coenzyme is non-protein part of enzyme necessary for E function. Often involved with the transfer of molecules between substrates (e.g. NAD). Many vitamins are coenzymes (e.g. folic acid, riboflavin).*
- *Apoenzyme is protein part of enzyme, gives specificity to reaction.*

10. Describe the **relationship** between ATP and ADP.
- *ATP and ADP are nucleotides that differ only in that ATP has 3 phosphate groups, while ADP has two (hence the names). ATP is constantly being produced from inorganic Phosphate, and ADP (this reaction requires energy), and constantly being broken down to P_i and ADP (this reaction releases energy).*