Modified True/False: Indicate whether the statement is true or false. If false, change the word or phrase needed to make the statement true.

__FALSE____ 1. Enzymes are the same as hormones.  
               Proteins or catalysts

__TRUE____ 2. Lysosomes contain digestive enzymes.

__FALSE____ 3. Sucrose and sucrase are both enzymes. Sucrase is an enzyme, sucrose is a substrate

__TRUE____ 4. Enzymes are not able to withstand temperatures higher than 50°C.

__TRUE____ 5. Enzymes are able to reduce the activation energy of chemical reactions in the body.

__FALSE____ 6. Enzymes speed up chemical reactions; however, they are NOT consumed by the reaction.

__FALSE____ 7. No enzymes are present in the mitochondria because there are no chemical reactions occurring there. Several enzymes are present since several reactions are occurring there.

1. Match the following. Each answer will only be used once.
   a. active site __1__
      1. a portion of an enzyme to which a substrate can attach
   b. substrate __7__
   c. protein __2__
   d. catalyst __6__
   e. inhibitor __4__
   f. product __3__
      2. all enzymes fit into this class of macromolecules
      3. the result of a chemical reaction
      4. a molecule that prevents an enzyme from working
      5. a molecule that speeds up chemical reactions
      7. the chemical on which the enzyme acts

2. Circle the enzymes in the following list:
   ATP  phosphorylase  maltase  sucrose
   insulin  carbonic anhydrase  fructose  amylase

Short Answer

3. What is an enzyme? Describe it in your own words.
   A protein that is designed to bind to a specific substance to speed up the reaction it undergoes. It effectively reduces the energy required for the reaction to occur by acting as a catalyst. It does not get consumed in the reaction but instead is a helper that can be reused over and over.

4. What is a substrate?
   A substrate is the substance that an enzyme acts upon.

5. Is there an optimum pH for enzymes in the human body? Explain why or why not.
   Different parts of the human body have different optimal pH levels. For example enzymes in the stomach operate at a pH of 4, whereas enzymes in the blood operate at a pH of 7.

6. Is there an optimum temperature for enzymes in the human body? Explain why or why not.
   Optimal temperature for enzymes in the body are at body temperature, about 37 degrees Celsius.

7. Are enzymes permanently changed in the chemical reactions they are involved in? Explain why or why not.
   Enzymes do not permanently change, they are reused over and over because they simply bind to their substrate to speed up the reaction and then move on to another substrate.

8. Identify two specific places in the cell where enzymes can be found.
   Enzymes can be found in the mitochondria and along the cell membrane.
9. Is it likely that an enzyme that will catalyze a sugar could also catalyze a protein? Why or why not? 
   *Enzymes are specific to their substrate, so this is not likely. Even different sugars have different enzymes.*

10. An enzyme called zymase is responsible for converting sugar into carbon dioxide and alcohol. As this conversion takes place, the reaction gradually slows down. Why?
   *The reaction slows down since there is less substrate for the enzymes to bind to, so less reaction occurs.*

11. Can enzymes be reused? Explain why or why not.
   *Enzymes are always reused as they are not consumed in the reaction, they are catalysts, not reactants.*

12. Explain how an enzyme changes the activation energy of a reaction.
   *They lower the activation energy by speeding up the reaction by binding to the substrate.*

13. What is meant by active site?
   *Site on the substrate where the enzyme binds to.*

14. Sketch and label the enzyme-substrate complex.

15. What is meant by induced fit? What induces an enzyme to change the shape of its active site?
   *The enzyme does not fit rigidly into the substrate, it changes its shape slightly to fit into the substrate. Bonds with the substrate induce the enzyme to change its shape.*

16. List 3 factors that can affect enzyme activity and describe how they affect activity.
   *Temperature, pH, and substrate concentration.*
   *At optimal temperature and pH, enzyme activity is at a maximum. Beyond those optimal values, enzyme activity decreases. As substrate concentration decreases, enzyme activity decreases.*