SOLUTIONS

Unit 3: Enzymes

3.1: Mode of action of enzymes

1. **C**
   The diagram suggests molecule P is an enzyme, and molecules R and S fit into its active site, indicating that they are likely substrates interacting with P during an enzyme-catalyzed reaction.
2. **C**
   The enzyme catalyzes the hydrolysis of sucrose into fructose, a reducing sugar. This explains why the honey sample tested positive (orange) while the nectar did not (blue).
3. **A**
   Enzymes facilitate reactions by bringing reacting molecules closer (statement 1), lowering the activation energy needed (statement 2), and allowing reactions to occur at lower temperatures (statement 3).
4. **D**
   Statement 3 is correct because the induced fit model explains that the substrate binds to the enzyme's active site and is converted to product via interactions with specific R-groups.
5. **A**
   The substrate for CYP3A4 are toxins. Furanocoumarins are potential inhibitors of CYP3A4. However, the question doesn't specify whether furanocoumarins are competitive or non-competitive inhibitors since it did not mention whether increasing the concentration of substrate (toxin) overcomes the enzyme inhibition or not.
   Option A is correct for any enzyme as they increase the rate of reaction by lowering the activation energy
   Option B is incorrect as the question states that the substrates are toxins found in some fruits not the fruits themselves
   Option C is incorrect as it is not specified in the question that furanocoumarins is a non-competitive inhibitor.
   Option D is incorrect as it is not specified in the question that furanocoumarins is a competitive inhibitor
6. **B**
   The activation energy of a reaction is the minimum energy that must be overcome for reactants to be transformed into products. Enzymes work by lowering this activation energy, making the reaction proceed more quickly at lower temperatures. On the graph, the region indicating the activation energy for the enzyme-catalyzed reaction is represented by the peak height of the curve labeled "with enzyme." This peak is lower than that of the curve labeled "without enzyme," illustrating the reduced amount of energy required to initiate the reaction due to the presence of the enzyme.
7. **A**
   All the statements suggest that the modified protein's altered structure, shape, or properties prevent it from being effectively recognized and degraded by protein-digesting enzymes. This is due to:
   1. Changes in tertiary structure, making it harder for enzymes to break it down.
   2. Loss of shape complementary with the enzyme's active site, reducing susceptibility to digestion.
   3. Inability to induce a proper fit with the protein-digesting enzyme, resisting degradation.
   The statements highlight the importance of protein structure and shape in enzyme-substrate interactions, and how modifications can lead to resistance to degradation.