General Biology II (101-HTK)

Energy, Enzymes & Metabolism Concepts and Learning Outcomes

Topic	Concept	Learning Outcomes
Enzymes: activation energy, specificity, and active site	1. Enzymes are biological catalysts that speed up chemical reactions without themselves being used up. 2. Enzymes lower the activation energy of reactions. 3. Enzymes have active sites (where catalysis takes place) that bind to specific substrates, forming an enzyme–substrate complex.	1. Define enzyme and explain how an enzyme lowers the required energy of activation for a reaction 2. Explain what is meant by the specificity of enzymes
Effect of substrate concentration on enzymatic reaction rate	4. Substrate concentration affects the rate of an enzymatic reaction; at high substrate concentration, all active sites are occupied, and saturation point is reached.	3. Using an annotated graph, explain the effect of increasing substrate concentration on rate of enzymatic activity
Regulation of enzyme activity: inhibitors , allosteric enzymes, and environmental factors	5. Enzyme activity is subjected to regulation by various means, including inhibitors and allosteric enzymes. 6. Enzymatic activity can be inhibited by natural and artificial agents through reversible or irreversible inhibition. 7. Reversible inhibition is temporary and comprises competitive (inhibitor competes with substrate) and non-competitive inhibition (inhibitor changes the shape of the active site), while irreversible inhibition causes permanent damage to active site of enzyme. 8. An allosteric enzyme has a catalytic site (active site) and a regulatory site (allosteric site) that is involved in the regulation of enzyme activity through changing the shape of the enzyme.	4. Compare and contrast reversible and irreversible inhibition of enzymes and relate enzyme inhibition to regulation of metabolism 5. Distinguish between competitive and non-competitive inhibition of enzymes 6. Define allosteric enzymes and explain their role in regulating metabolic pathways by using the concept of feedback inhibition 7. Describe the effect of pH and temperature on enzymatic activity

9. The rates of most enzymatic reactions are affected by interfering molecules (eg, inhibitors and activators) and by environmental factors (such as pH and temperature).