

Energy-Enzyme Assessment

Period 3 _____

Period 4 _____

Period 5 _____

Period 6 _____

Period 7 _____

MULTIPLE CHOICE – Choose the one alternative that best completes the statement or answers the question.

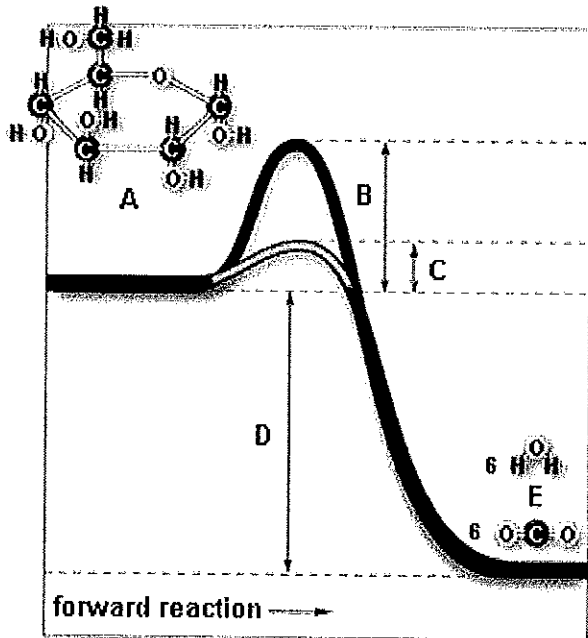
1. **In the reaction $A \rightarrow B + C + \text{heat}$...**
 - A. the potential energy of the products is greater than that of the reactant.
 - B. entropy has decreased.
 - C. the potential energy of the products is the same as that of the reactant.
 - D. there is a net input of energy.
 - E. the potential energy of the products is less than that of the reactant.
2. **Glucose molecules provide energy to power the swimming motion of sperm. In this example, the sperm are changing...**
 - A. chemical energy into kinetic energy.
 - B. chemical energy into potential energy.
 - C. kinetic energy into chemical energy.
 - D. kinetic energy into potential energy.
 - E. None of the choices are correct.
3. **When an enzyme catalyzes a reaction...**
 - A. it becomes a product.
 - B. it acts as a reactant.
 - C. it raises the activation energy of the reaction.
 - D. it lowers the activation energy of the reaction.
 - E. None of the choices are correct.
4. **How does inhibition of an enzyme-catalyzed reaction by a competitive inhibitor differ from inhibition by a noncompetitive inhibitor?**
 - A. Competitive inhibitors are inorganic substances such as metal ions; noncompetitive inhibitors are vitamins or vitamin derivatives.
 - B. Competitive inhibitors bind to the enzyme reversibly; noncompetitive inhibitors bind to it irreversibly.
 - C. Competitive inhibitors interfere with the enzyme; noncompetitive inhibitors interfere with the reactants.
 - D. Competitive inhibitors change the enzyme's tertiary structure; noncompetitive inhibitors cause polypeptide subunits to dissociate.
 - E. Competitive inhibitors bind to the active site of the enzyme; noncompetitive inhibitors bind to a different site.
5. **The energy required to initiate an exergonic reaction is called...**
 - A. endergonic energy.
 - B. exergonic energy.
 - C. nothing; spontaneous reactions do not require an input of energy.
 - D. the energy of activation.
 - E. hydrolytic energy.
6. **Anything that prevents ATP formation will most likely...**
 - A. force the cell to rely on lipids for energy.
 - B. result in cell death.
 - C. result in the conversion of kinetic energy to potential energy.
 - D. have no effect on the cell.
 - E. force the cell to rely on ADP for energy.

7. **The more heat released by a reaction, the...**
- A. greater the amount of potential energy in the products of the reaction.
 - B. greater the increase in entropy.
 - C. less the increase in entropy.
 - D. less the conservation of energy.
 - E. greater the conservation of energy.
8. **Which one of the following is true?**
- A. An enzyme's function is unaffected by changes in pH.
 - B. Enzymes are the reactants in a chemical reaction.
 - C. All enzymes depend on protein cofactors to function.
 - D. Enzymes are inorganic.
 - E. Enzymes catalyze specific reactions.
9. **Malathion and tetracycline are both enzyme inhibitors. Malathion is used to kill insects; tetracycline to kill bacteria. Malathion is more toxic to human cells than is tetracycline. Which of the following explanations for the difference in toxicity to human cells would be reasonable?**
- A. Malathion binds to its enzyme reversibly; tetracycline binds to its enzyme irreversibly.
 - B. Human cells do not contain the enzymes inhibited by malathion or tetracycline.
 - C. Human cells contain the enzymes inhibited by both compounds, but the enzyme inhibited by malathion is not metabolically crucial.
 - D. Malathion is a competitive inhibitor; tetracycline is a noncompetitive inhibitor.
 - E. None of the choices are correct.
10. **Which of the following is a coenzyme?**
- A. iodine
 - B. zinc
 - C. iron
 - D. vitamin B6
 - E. hydrogen ions
11. **When a cell uses chemical energy to perform work, it couples a(n) _____ reaction with a(n) _____ reaction.**
- A. exergonic . . . spontaneous
 - B. endergonic . . . spontaneous
 - C. spontaneous . . . exergonic
 - D. endergonic . . . exergonic
 - E. exergonic . . . endergonic
12. **Most of a cell's enzymes are...**
- A. proteins.
 - B. amino acids.
 - C. carbohydrates.
 - D. nucleic acids.
 - E. lipids.
13. **Which one of the following statements concerning energy is false?**
- A. During photosynthesis, plants convert kinetic energy into chemical energy.
 - B. Fireflies are able to take potential energy in the form of food and convert that energy into kinetic energy in the form of heat and light.
 - C. Living systems convert heat energy into chemical energy to reduce entropy.
 - D. Energy transformations in cells are accompanied by the release of heat energy.
 - E. A gasoline engine converts chemical energy into kinetic energy.

14. **Which one of the following is true about the ATP molecule?**
- A. It contains the six-carbon sugar hexose.
 - B. It contains a nitrogenous base molecule called adenine.
 - C. Extremely stable bonds link the second and third phosphate groups.
 - D. It contains two phosphate groups.
 - E. It contains a nucleotide called triphosphate.
15. **According to _____, energy cannot be created or destroyed.**
- A. Aristotle's first principle
 - B. the third law of thermodynamics
 - C. the first law of thermodynamics
 - D. Einstein's law of relativity
 - E. the second law of thermodynamics
16. **A child is brought to the hospital with a fever of 107°F. Doctors immediately order an ice bath to lower the child's temperature. Which explanation offers the most logical reason for this action?**
- A. Elevated body temperatures easily break the covalent bonds linking biologically important molecules. This will cause a general breakdown of cell structures.
 - B. Elevated body temperature will increase reaction rates in the child's cells and overload the limited number of enzymes found in the cell.
 - C. Elevated body temperatures may denature enzymes. This would interfere with the cell's abilities to catalyze various reactions.
 - D. Elevated body temperatures will increase the energy of activation needed to start various chemical reactions in the body. This will interfere with the ability of enzymes to catalyze vital chemical reactions.
 - E. Elevated body temperatures cause molecules to vibrate more quickly and prevent enzymes from easily attaching to reactants. This would slow vital body reactions.
17. **Which one of the following processes is endergonic?**
- A. the breakdown of glucose
 - B. the synthesis of glucose from carbon dioxide and water
 - C. the release of heat from the breakdown of glucose
 - D. cellular respiration
 - E. the burning of wood
18. **A steer must eat at least 100 pounds of grain to gain less than 10 pounds of muscle tissue. This illustrates...**
- A. that some energy is destroyed in every energy conversion.
 - B. the second law of thermodynamics.
 - C. that energy transformations are typically 100% efficient.
 - D. the first law of thermodynamics.
 - E. that thermodynamics does not apply to living systems.
19. **Heating inactivates enzymes by...**
- A. removing phosphate groups from the enzyme.
 - B. changing the enzyme's three-dimensional shape.
 - C. breaking the covalent bonds that hold the molecule together.
 - D. causing enzyme molecules to stick together.
 - E. None of the choices are correct.

20. **Substrates bind to an enzyme's _____ site.**
- A. allosteric
 - B. regulatory
 - C. phosphate
 - D. reactant
 - E. active
21. **The transfer of a phosphate group to a molecule or compound is called...**
- A. carboxylation.
 - B. phosphorylation.
 - C. ionization.
 - D. hydrogenation.
 - E. hydrogen bonding.
22. **Living systems...**
- A. violate the first law of thermodynamics.
 - B. decrease their entropy while increasing the entropy of the universe.
 - C. are examples of a closed system.
 - D. violate the second law of thermodynamics.
 - E. increase their entropy while decreasing the entropy of the universe.
23. **The active site of an enzyme is...**
- A. the highly changeable portion of an enzyme that adapts to fit the substrates of various reactions.
 - B. the region of an enzyme that attaches to a substrate.
 - C. the region of a product that detaches from the enzyme.
 - D. the region of a substrate that is changed by an enzyme.
 - E. None of the choices are correct.
24. **What is the basic difference between exergonic and endergonic reactions?**
- A. Exergonic reactions result in a net release energy; endergonic reactions result in a net absorption of energy.
 - B. In exergonic reactions, the reactants have less chemical energy than the products; in endergonic reactions, the opposite is true.
 - C. Exergonic reactions are anabolic; endergonic reactions are catabolic.
 - D. Exergonic reactions involve the formation of bonds; endergonic reactions involve the breaking of bonds.
 - E. Exergonic reactions involve ionic bonds; endergonic reactions involve covalent bonds.
25. **Ultimately, nearly all animals are dependent on _____ as their source of energy.**
- A. heat
 - B. wind
 - C. cellular respiration
 - D. photosynthesis
 - E. electricity
26. **Which one of the following is false?**
- A. Enzymes are very specific for certain substrates.
 - B. An enzyme binds to its substrate at the enzyme's active site.
 - C. An enzyme's function depends on its three-dimensional shape.
 - D. Enzymes emerge unchanged from the reactions they catalyze.
 - E. Enzymes are used up in chemical reactions.

27. **Inhibition of an enzyme is irreversible when...**
- a noncompetitive inhibitor is involved.
 - the shape of the enzyme is changed.
 - a competitive inhibitor is involved.
 - covalent bonds form between inhibitor and enzyme.
 - hydrogen bonds form between inhibitor and enzyme.



Refer to the graph above to answer the following items. Each answer may be used once, more than once or not at all.

- Which letter on the figure corresponds to activation energy without an enzyme?
 - Which letter on the figure corresponds to activation energy with enzyme?
 - Which letter on the figure corresponds to energy released by the reaction?
 - Which letter on the figure corresponds to the substrate?
 - Which letter on the figure corresponds to the product?
33. **The products of anabolic pathways are usually...**
- larger and lower in energy.
 - smaller and lower in energy.
 - larger and higher in energy.
 - smaller and higher in energy.
 - equal to the reactants concerning the amount of energy.
34. **Environmental factors that control enzymatic reactions are...**
- pH
 - salinity
 - inhibitors
 - temperature
- I and III.
 - II and III.
 - III and IV.
 - I, II and III.
 - I, II and IV.

ANSWER KEY

- 1.E
- 2.A
- 3.D
- 4.E
- 5.D
- 6.B
- 7.B
- 8.E
- 9.C
- 10.D
- 11.E
- 12.A
- 13.C
- 14.B
- 15.C
- 16.C
- 17.B
- 18.B
- 19.B
- 20.E
- 21.B
- 22.B
- 23.B
- 24.A
- 25.D
- 26.E
- 27.D
- 28.B
- 29.C
- 30.D
- 31.A
- 32.E
- 33.C
- 34.E