

## 2010-10-13 AP BIOLOGY FIRST QUARTER EXAM

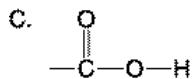
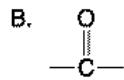
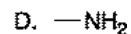
### Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- \_\_\_\_ 1. What is the difference between covalent bonds and ionic bonds?
- Covalent bonds involve the sharing of protons between atoms, and ionic bonds involve the sharing of electrons between atoms.
  - Covalent bonds involve the sharing of neutrons between atoms, and ionic bonds involve the sharing of electrons between atoms.
  - Covalent bonds involve the sharing of electrons between atoms, and ionic bonds involve the electrical attraction between atoms.
  - Covalent bonds involve the sharing of protons between atoms, and ionic bonds involve the sharing of neutrons between atoms.
  - Covalent bonds involve the transfer of electrons between atoms, and ionic bonds involve the sharing of neutrons between atoms.
- \_\_\_\_ 2. Which of the following is *not* considered to be a weak molecular interaction?
- a covalent bond
  - a van der Waals interaction
  - an ionic bond in the presence of water
  - a hydrogen bond
  - A and B only
- \_\_\_\_ 3. An example of a hydrogen bond is the bond between
- C and H in methane ( $\text{CH}_4$ ).
  - the H of one water molecule and the O of another water molecule.
  - $\text{Na}^+$  and  $\text{Cl}^-$  in salt.
  - the two hydrogen atoms in a molecule of hydrogen gas ( $\text{H}_2$ ).
  - $\text{Mg}^+$  and  $\text{Cl}^-$  in  $\text{MgCl}_2$ .
- \_\_\_\_ 4. Which of the following is true when an ice cube cools a drink?
- Molecule collisions in the drink increase.
  - Kinetic energy in the drink decreases.
  - A calorie of heat energy is transferred from the ice to the water of the drink.
  - The specific heat of the water in the drink decreases.
  - Evaporation of the water in the drink increases.
- \_\_\_\_ 5. Ice is lighter and floats in water because it is a crystalline structure in which each water molecule is bonded to a maximum of four other water molecules by which kind of bond?
- ionic
  - hydrogen
  - covalent
  - A and C only
  - A, B, and C
- \_\_\_\_ 6. Which of the following ionizes completely in solution and is considered to be a strong acid?
- $\text{NaOH}$
  - $\text{HCl}$
  - $\text{NH}_3$
  - $\text{H}_2\text{CO}_3$
  - $\text{CH}_3\text{COOH}$
- \_\_\_\_ 7. Which is the best description of a carbonyl group?
- an oxygen joined to a carbon by a single covalent bond

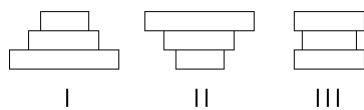
- b. a nitrogen and two hydrogens joined to a carbon by covalent bonds
- c. a carbon joined to two hydrogens by single covalent bonds
- d. a sulfur and a hydrogen joined to a carbon by covalent bonds
- e. a carbon atom joined to an oxygen by a double covalent bond

Use the figure below to answer the following questions.



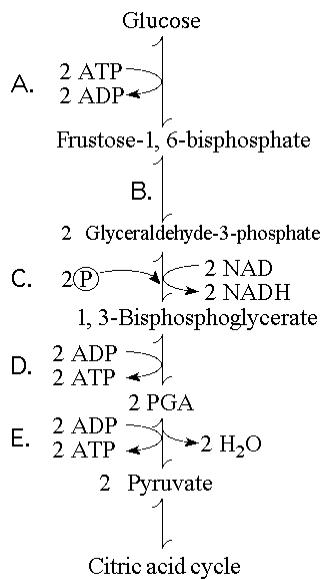
- \_\_\_\_ 8. Which is a hydroxyl functional group?
- a. Group A
  - b. Group B
  - c. Group C
  - d. Group D
  - e. Group E
- \_\_\_\_ 9. Which of the following is *not* one of the four major groups of macromolecules found in living organisms?
- a. glucose
  - b. carbohydrates
  - c. lipids
  - d. proteins
  - e. nucleic acids
- \_\_\_\_ 10. The time during imprinting when specific behaviors can be learned is called the
- a. window of imprinting.
  - b. major period.
  - c. sensitive period.
  - d. timing imprint.
  - e. significant window.
- \_\_\_\_ 11. The presence of altruistic behavior in animals is most likely due to kin selection, a theory maintaining that
- a. aggression between sexes promotes the survival of the fittest individuals.
  - b. genes enhance survival of copies of themselves by directing organisms to assist others who share those genes.
  - c. companionship is advantageous to animals because in the future they can help each other.
  - d. critical thinking abilities are normal traits for animals and they have arisen, like other traits, through natural selection.
  - e. natural selection has generally favored the evolution of exaggerated aggressive and submissive behaviors to resolve conflict without grave harm to participants.
- \_\_\_\_ 12. How would the dispersion of humans in the United States best be described?
- a. dense
  - b. clumped
  - c. random
  - d. intrinsic
  - e. uniform

*The following questions refer to the figure below, which depicts the age structure of three populations.*



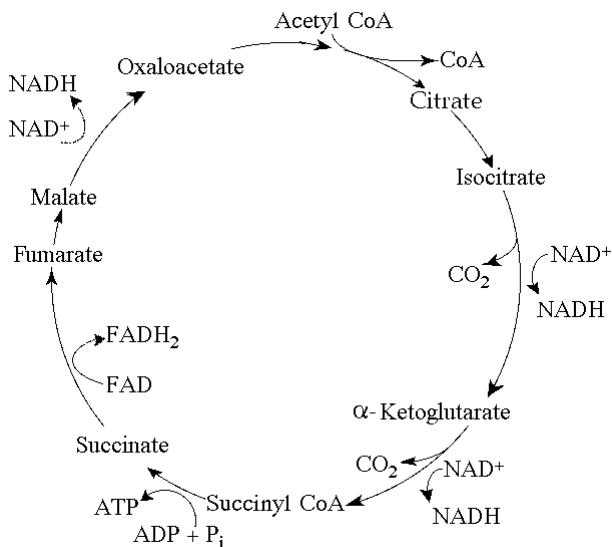
- \_\_\_\_ 13. Assuming these age-structure diagrams describe human populations, which population is likely to experience zero population growth (ZPG)?
- I
  - II
  - III
  - I and II
  - II and III
- \_\_\_\_ 14. All of the following have contributed to the growth of the human population *except*
- environmental degradation.
  - improved nutrition.
  - vaccines.
  - pesticides.
  - improved sanitation.
- \_\_\_\_ 15. The species richness of a community refers to the
- number of food chains.
  - number of different species.
  - energy content of all species.
  - relative numbers of individuals in each species.
  - total number of all organisms.
- \_\_\_\_ 16. Which of the following are prokaryotic cells?
- plants
  - fungi
  - bacteria
  - animals
  - B and C only

*The figure below illustrates some of the steps (reactions) of glycolysis in their proper sequence. Each step is lettered. Use these letters to answer the following questions.*



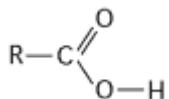
- \_\_\_\_ 17. In which step is an inorganic phosphate added to the reactant?
- A
  - B
  - C
  - D
  - E
- \_\_\_\_ 18. During cellular respiration, acetyl CoA accumulates in which location?
- cytosol
  - mitochondrial outer membrane
  - mitochondrial inner membrane
  - mitochondrial intermembrane space
  - mitochondrial matrix
- \_\_\_\_ 19. How many carbon atoms are fed into the citric acid cycle as a result of the oxidation of one molecule of pyruvate?
- 2
  - 4
  - 6
  - 8
  - 10

*Refer to the figure below, showing the citric acid cycle, as a guide to answer the following questions.*



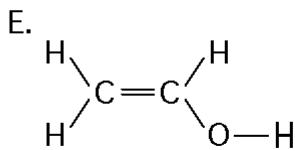
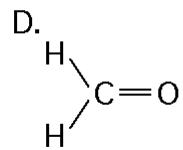
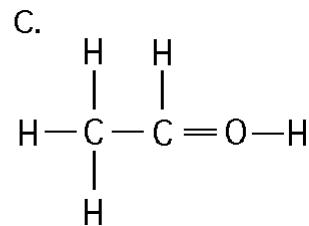
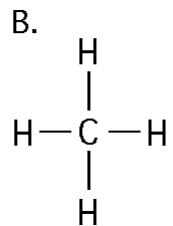
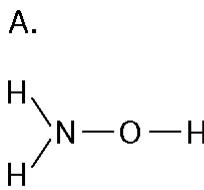
- \_\_\_\_ 20. Starting with one molecule of citrate and ending with oxaloacetate, how many ATP molecules can be formed from oxidative phosphorylation (chemiosmosis)?
- 1
  - 3
  - 4
  - 11
  - 12
- \_\_\_\_ 21. How many reduced dinucleotides would be produced with four turns of the citric acid cycle?
- 1 FADH<sub>2</sub> and 4 NADH
  - 2 FADH<sub>2</sub> and 8 NADH
  - 4 FADH<sub>2</sub> and 12 NADH
  - 1 FAD and 4 NAD<sup>+</sup>
  - 4 FAD<sup>+</sup> and 12 NAD<sup>+</sup>
- \_\_\_\_ 22. Carbon dioxide (CO<sub>2</sub>) is released during which of the following stages of cellular respiration?
- glycolysis and the oxidation of pyruvate to acetyl CoA
  - oxidation of pyruvate to acetyl CoA and the citric acid cycle
  - the citric acid cycle and oxidative phosphorylation
  - oxidative phosphorylation and fermentation
  - fermentation and glycolysis
- \_\_\_\_ 23. Paracrine signaling
- involves secreting cells acting on nearby target cells by discharging a local regulator into the extracellular fluid.
  - requires nerve cells to release a neurotransmitter into the synapse.
  - occurs only in paracrine yeast cells.
  - has been found in plants but not animals.
  - involves mating factors attaching to target cells and causing production of new paracrine cells.
- \_\_\_\_ 24. Chemical signal pathways
- operate in animals, but not in plants.
  - are absent in bacteria, but are plentiful in yeast.
  - involve the release of hormones into the blood.
  - often involve the binding of signal molecules to a protein on the surface of a target cell.

- e. use hydrophilic molecules to activate enzymes.
- \_\_\_\_ 25. The toxin of *Vibrio cholerae* causes profuse diarrhea because it
- modifies a G protein involved in regulating salt and water secretion.
  - decreases the cytosolic concentration of calcium ions, making the cells hypotonic to the intestinal cells.
  - binds with adenylyl cyclase and triggers the formation of cAMP.
  - signals inositol trisphosphate to become a second messenger for the release of calcium.
  - modifies calmodulin and activates a cascade of protein kinases.
- \_\_\_\_ 26. What is the name of the functional group shown in the following figure?



- carbonyl
- ketone
- aldehyde
- carboxyl
- hydroxyl

*Use the figure below to answer the following questions.*

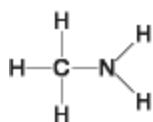


- \_\_\_\_ 27. Which of the structures is an impossible covalently bonded molecule?
- A
  - B
  - C
  - D
  - E
- \_\_\_\_ 28. Which molecule is an alcohol?
- Molecule A
  - Molecule B
  - Molecule C
  - Molecule D
  - Molecule E
- \_\_\_\_ 29. Which molecules contain a carbonyl group?
- A and B

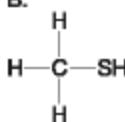
- b. B and C
- c. C and D
- d. D and E
- e. E and A

*Use the molecules shown in the figure below to answer the following questions..*

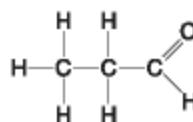
A.



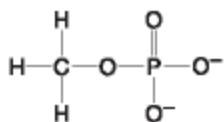
B.



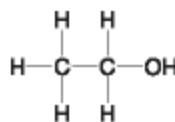
C.



D.



E.



- \_\_\_\_ 30. Which molecule contains a sulfhydryl functional group?
- a. Molecule A
  - b. Molecule B
  - c. Molecule C
  - d. Molecule D
  - e. Molecule E
- \_\_\_\_ 31. Which type of organism obtains energy by metabolizing molecules produced by other organisms?
- a. autotrophs
  - b. heterotrophs
  - c. decomposers
  - d. B and C
  - e. A, B, and C
- \_\_\_\_ 32. Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin cycle?
- a. CO<sub>2</sub> and glucose
  - b. H<sub>2</sub>O and O<sub>2</sub>
  - c. ADP, P<sub>i</sub>, and NADP<sup>+</sup>
  - d. electrons and H<sup>+</sup>
  - e. ATP and NADPH
- \_\_\_\_ 33. All of the events listed below occur in the light reactions of photosynthesis *except*
- a. oxygen is produced.
  - b. NADP<sup>+</sup> is reduced to NADPH.
  - c. carbon dioxide is incorporated into PGA.
  - d. ADP is phosphorylated to yield ATP.
  - e. light is absorbed and funneled to reaction-center chlorophyll *a*.
- \_\_\_\_ 34. What does cyclic electron flow in the chloroplast produce?
- a. ATP
  - b. NADPH
  - c. glucose
  - d. A and B
  - e. A, B, and C

- \_\_\_\_ 35. As a research scientist, you measure the amount of ATP and NADPH consumed by the Calvin cycle in 1 hour. You find 30,000 molecules of ATP consumed, but only 20,000 molecules of NADPH. Where did the extra ATP molecules come from?
- photosystem II
  - photosystem I
  - cyclic electron flow
  - noncyclic electron flow
  - chlorophyll
- \_\_\_\_ 36. What does the chemiosmotic process in chloroplasts involve?
- establishment of a proton gradient
  - diffusion of electrons through the thylakoid membrane
  - reduction of water to produce ATP energy
  - movement of water by osmosis into the thylakoid space from the stroma
  - formation of glucose, using carbon dioxide, NADPH, and ATP
- \_\_\_\_ 37. In a plant cell, where are the ATP synthase complexes located?
- thylakoid membrane
  - plasma membrane
  - inner mitochondrial membrane
  - A and C
  - A, B, and C
- \_\_\_\_ 38. Of the following, what do both mitochondria and chloroplasts have in common?
- thylakoid membranes
  - chemiosmosis
  - ATP synthase
  - B and C only
  - A, B, and C

*Refer to the choices to answer the following questions. Each choice may be used once, more than once, or not at all. Indicate whether the following events occur during*

- A. photosynthesis
  - B. respiration
  - C. both photosynthesis and respiration
  - D. neither photosynthesis nor respiration
- \_\_\_\_ 39. synthesis of ATP by the chemiosmotic mechanism
- A
  - B
  - C
  - D
- \_\_\_\_ 40. reduction of oxygen which forms water
- A
  - B
  - C
  - D
- \_\_\_\_ 41. the splitting of carbon dioxide to form oxygen gas and carbon compounds
- A
  - B
  - C
  - D

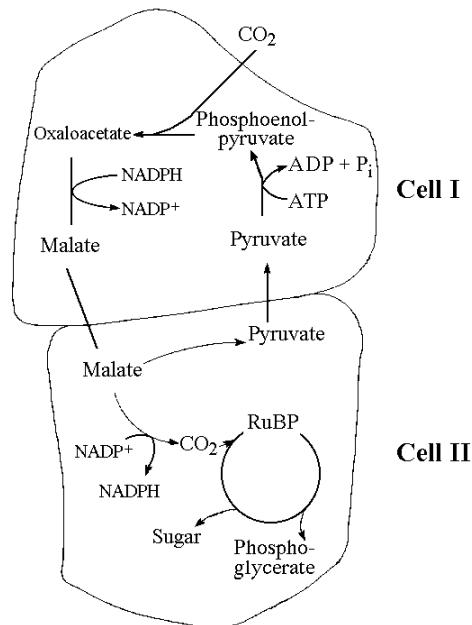
- \_\_\_\_ 42. Where do the enzymatic reactions of the Calvin cycle take place?
- stroma of the chloroplast
  - thylakoid membranes
  - outer membrane of the chloroplast
  - electron transport chain
  - thylakoid space
- \_\_\_\_ 43. Which statement is *false*?
- Thylakoid membranes contain the photosynthetic pigments.
  - The O<sub>2</sub> released during photosynthesis comes from water.
  - RuBP is produced during cyclic electron flow in the light reactions of photosynthesis.
  - The light reactions of photosynthesis provide the energy for the Calvin cycle.
  - When chlorophyll is reduced, it gains electrons.
- \_\_\_\_ 44. All of the following statements are correct regarding the Calvin cycle *except*:
- The energy source utilized is the ATP and NADPH obtained through the light reaction.
  - These reactions begin soon after sundown and end before sunrise.
  - The 5-carbon sugar RuBP is constantly being regenerated.
  - One of the end products is glyceraldehyde phosphate.
  - Rubisco attaches carbon dioxide to ribulose bisphosphate.

*For the following questions, compare the light reactions with the Calvin cycle of photosynthesis in plants. Use the following key:*

- A. light reactions alone
  - B. the Calvin cycle alone
  - C. both the light reactions and the Calvin cycle
  - D. neither the light reactions nor the Calvin cycle
  - E. occurs in the chloroplast but is not part of photosynthesis
- \_\_\_\_ 45. produces molecular oxygen (O<sub>2</sub>)
- A
  - B
  - C
  - D
  - E
- \_\_\_\_ 46. requires ATP
- A
  - B
  - C
  - D
  - E
- \_\_\_\_ 47. produces NADH
- A
  - B
  - C
  - D
  - E
- \_\_\_\_ 48. produces NADPH
- A
  - B
  - C

- d. D
- e. E

Use the figure below to answer the following statements.



- \_\_\_\_ 49. Which of the following statements is *true* concerning the figure?
- a. It represents cell processes involved in C<sub>4</sub> photosynthesis.
  - b. It represents the type of cell structures found in CAM plants.
  - c. It represents an adaptation that minimizes photorespiration.
  - d. A and C are true.
  - e. A, B, and C are true.
- \_\_\_\_ 50. Photorespiration lowers the efficiency of photosynthesis by preventing the formation of
- a. carbon dioxide molecules.
  - b. 3-phosphoglycerate molecules.
  - c. ATP molecules.
  - d. ribulose bisphosphate molecules.
  - e. RuBP carboxylase molecules.

**2010-10-13 AP BIOLOGY FIRST QUARTER EXAM**  
**Answer Section**

**MULTIPLE CHOICE**

- |            |                               |
|------------|-------------------------------|
| 1. ANS: C  | TOP: Concept 2.3              |
| 2. ANS: A  | TOP: Concept 2.3              |
| 3. ANS: B  | TOP: Concept 3.1              |
| 4. ANS: B  | TOP: Concept 3.2              |
| 5. ANS: B  | TOP: Concept 3.2              |
| 6. ANS: B  | TOP: Concept 3.3              |
| 7. ANS: E  | TOP: Concept 4.3              |
| 8. ANS: A  | TOP: Concept 4.3              |
| 9. ANS: A  | TOP: Overview                 |
| 10. ANS: C | TOP: Concept 51.1             |
| 11. ANS: B | TOP: Concept 51.6             |
| 12. ANS: B | TOP: Concept 52.1             |
| 13. ANS: C | TOP: Concept 52.6             |
| 14. ANS: A | TOP: Concept 52.6             |
| 15. ANS: B | TOP: Concept 53.2             |
| 16. ANS: C | TOP: Concept 6.2              |
| 17. ANS: C | TOP: Concept 9.2              |
| 18. ANS: E | TOP: Concept 9.3              |
| 19. ANS: A | TOP: Concept 9.3              |
| 20. ANS: D | TOP: Concept 9.3, Concept 9.4 |
| 21. ANS: C | TOP: Concept 9.3              |
| 22. ANS: B | TOP: Concept 9.3              |
| 23. ANS: A | TOP: Concept 11.1             |
| 24. ANS: D | TOP: Concept 11.2             |
| 25. ANS: A | TOP: Concept 11.3             |
| 26. ANS: D | TOP: Concept 4.3              |
| 27. ANS: C | TOP: Concept 4.3              |
| 28. ANS: A | TOP: Concept 4.3              |
| 29. ANS: B | TOP: Concept 4.3              |
| 30. ANS: B | TOP: Concept 4.3              |
| 31. ANS: D | TOP: Concept 10.1             |
| 32. ANS: E | TOP: Concept 10.1             |
| 33. ANS: C | TOP: Concept 10.2             |
| 34. ANS: A | TOP: Concept 10.2             |
| 35. ANS: C | TOP: Concept 10.2             |
| 36. ANS: A | TOP: Concept 10.2             |
| 37. ANS: D | TOP: Concept 10.2             |
| 38. ANS: D | TOP: Concept 10.2             |
| 39. ANS: C | TOP: Concept 10.2             |
| 40. ANS: B | TOP: Concept 10.2             |
| 41. ANS: C | TOP: Concept 10.2             |

- |            |                   |
|------------|-------------------|
| 42. ANS: A | TOP: Concept 10.3 |
| 43. ANS: C | TOP: Concept 10.3 |
| 44. ANS: B | TOP: Concept 10.3 |
| 45. ANS: A | TOP: Concept 10.2 |
| 46. ANS: B | TOP: Concept 10.3 |
| 47. ANS: D | TOP: Concept 10.3 |
| 48. ANS: A | TOP: Concept 10.2 |
| 49. ANS: D | TOP: Concept 10.4 |
| 50. ANS: B | TOP: Concept 10.4 |