

**BSC1010, Outcome Based Final Exam, Take Home Portion, F07**

*Outcome: Students will be able to assemble the atomic structure of simple elements using the periodic table.*

<p>How many protons must the following elements contain?</p> <ol style="list-style-type: none"> <li>Hydrogen</li> <li>Carbon</li> <li>Nitrogen</li> <li>Oxygen</li> <li>Phosphorous</li> </ol>	<p>Answers for questions at left.</p> <ol style="list-style-type: none"> <li>15</li> <li>1</li> <li>8</li> <li>6</li> <li>7</li> </ol>	
<ol style="list-style-type: none"> <li>How many neutrons does carbon 14 contain?</li> <li>How many electrons does carbon contain?</li> <li>How many electrons are in carbon's outer shell?</li> </ol>	<p>Answers for questions at left.</p> <ol style="list-style-type: none"> <li>8</li> <li>14</li> <li>6</li> <li>2</li> <li>4</li> </ol>	
<ol style="list-style-type: none"> <li>What is the atomic weight of hydrogen?</li> <li>How many new electrons does the hydrogen shown need to obtain to fill its outer shell?</li> <li>A hydrogen ion (H<sup>+</sup>) has how many electrons in its outer shell?</li> <li>The radioactive isotope tritium has an atomic weight of 3; how many neutrons does it contain?</li> </ol>	<p>Answers for questions at left.</p> <ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> <li>0</li> </ol>	<p><b>Hydrogen (H)</b></p>

*Outcome: Students will be able to critically discuss the special properties of water that make it a necessary component of life.*

13. When two atoms are equally electronegative, they will interact to form
- A) nonpolar covalent bonds.
  - B) polar covalent bonds.
  - C) ions.
  - D) equal numbers of isotopes.
  - E) ionic bonds.
- 14) What results from an unequal sharing of electrons between atoms, when one atom, such as oxygen, is more electronegative than the other, such as hydrogen?
- A) a hydrogen bond
  - B) a nonpolar covalent bond
  - C) a polar covalent bond
  - D) an ionic bond
  - E) a hydrophobic interaction
15. The partial negative charge at one end of a water molecule is attracted to the partial positive charge of another water molecule. What is this attraction called?
- a. a covalent bond
  - b. a hydrogen bond
  - c. an ionic bond
  - d. a hydration shell
  - e. a hydrophobic bond
16. Which bonds must be broken for water to vaporize; and which must be formed for water to condense?
- a. ionic bonds
  - b. nonpolar covalent bonds
  - c. polar covalent bonds
  - d. hydrogen bonds
  - e. Both polar covalent bonds and hydrogen bonds are correct.
17. Life on earth is dependant on all the properties of water as well as the abundance of water. Which property of water is probably most important for the functioning of organisms at the molecular level?
- a. cohesion and high surface tension
  - b. high specific heat
  - c. high heat of vaporization
  - d. expansion upon freezing
  - e. versatility as a solvent

Outcome: Students will be able to identify molecular bonds and apply bonding concepts to the four major organic molecules of life.

<p>Match the bond type with the most appropriate molecule below.</p> <p>18. protein 19. carbohydrate 20. lipid</p>	<p>Use these answers for the questions at left:</p> <p>a. ester b. peptide c. glycolytic</p>
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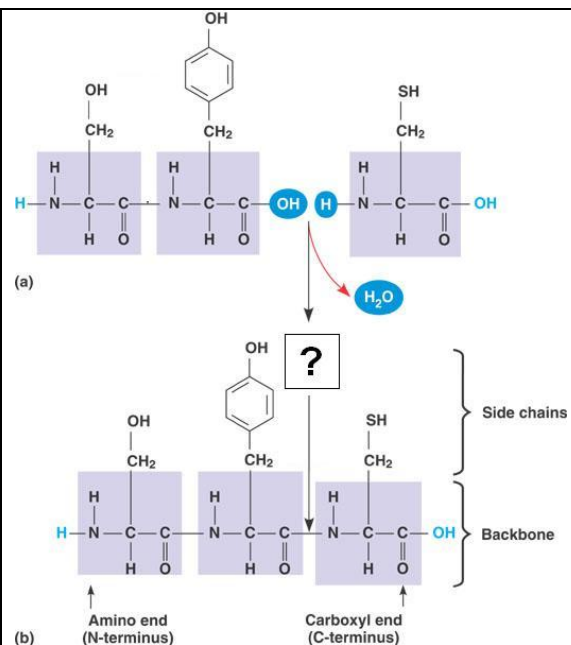
21. The bonds (ester, peptide, glycolytic) are best defined as
- covalent
  - ionic
  - hydrogen
22. The bonds (ester, peptide, glycolytic) are formed during
- hydrolysis
  - evaporation
  - dehydration synthesis
  - combustion
  - absorption by active transport

23. The chemical reactions illustrated in figure at right results in the formation of

- peptide bonds.
- ionic bonds.
- a glycosidic bond.
- a hydrogen bond.
- an isotope.

24. The reaction at right is performed by

- ribosome
- an enzyme during mitosis
- a carbohydrate during meiosis
- a gene
- all of the above



*Outcome: Students will be able to compare and contrast the similarities and differences between prokaryotic and eukaryotic cell structure and function.*

Match the answers at right with the following statements or questions.

<p>25. Small, usually 1-5 microns in length</p> <p>26. No internal membrane systems, not even a nuclear membrane.</p> <p>27. Lipid bilayer membrane surrounding the cell contents.</p> <p>28. One large circular chromosomes</p> <p>29. Linear chromosomes</p> <p>30. Called bacteria.</p> <p>31. Ecological function is decomposition.</p> <p>32. Uses ATP to power cellular work.</p> <p>33. High surface area to volume ratio</p> <p>34. Multicellular creatures with specialized cells</p> <p>35. Contain genes in the form of DNA.</p> <p>36. Requires water as the <i>solvent</i> dissolve the chemicals responsible for the metabolic disequilibrium we call <i>life</i>.</p>	<p>a. Eukaryotic cells</p> <p>b. Prokaryotic cells</p> <p>c. Both Eukaryotic and Prokaryotic Cells</p>
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Outcome: Students will be able to scrutinize critical functions played by the lipid and protein components of cell compartmentalization of eukaryotic cells.

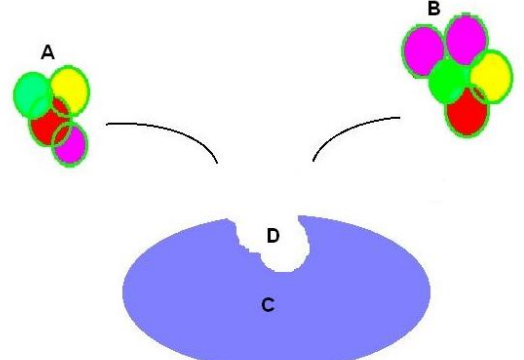
<p>37. Most likely carbon dioxide or oxygen?</p> <p>38. Active transport</p> <p>39. Facilitated diffusion</p> <p>40. Used to transport large quantities of glucose from food into the absorptive cells of the intestine.</p> <p>41. Moves molecules <i>uphill</i> or against their concentration gradient.</p>	
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<p><b>A.</b></p>	<p><b>B.</b></p>	<p><b>C.</b></p>	<p><b>D.</b></p>	<p><b>E.</b></p>
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Use the answers above for the following questions:

- 42. taste receptor cells
- 43. cell cell recognition
- 44. transport proteins
- 45. intercellular joining, responsible for cells holding together as tissues
- 46. responsible for Type A and Type B blood types.
- 47. Used in vaccinations and the immune response.

*Outcome: Students will be able to defend the current theories of enzyme structure and function and the role of enzymes in metabolism the role of enzymes in metabolism.*

<p>48. active site</p> <p>49. enzyme</p> <p>50. product</p> <p>51. substrate</p> <p>52. name most likely ends in ase</p>	
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53. According to the induced fit hypothesis of enzyme function, which of the following is correct?

- A) The binding of the substrate depends on the shape of the active site.
- B) Some enzymes become denatured when activators bind to the substrate.
- C) A competitive inhibitor can outcompete the substrate for the active site.
- D) The binding of the substrate to the active site causes the enzyme to change shape and squeeze the substrate slightly.
- E) The active site creates a microenvironment ideal for the reaction.

54. How does an enzyme catalyze a reaction?

- A) by supplying the energy to speed up a reaction
- B) by lowering the energy of activation barrier of a reaction
- C) by lowering the delta G of a reaction
- D) by changing the equilibrium of a spontaneous reaction
- E) by increasing the amount of free energy of a reaction

55. Which of these statements regarding enzymes is false?

- A) Enzymes are proteins that function as catalysts.
- B) Enzymes display specificity for certain molecules to which they attach.
- C) Enzymes provide activation energy for the reactions they catalyze.
- D) The activity of enzymes can be regulated by factors in their immediate environment.
- E) An enzyme may be used many times over for a specific reaction.

56. The active site of an enzyme is the region that

- A) has many nonpolar covalent bonds.
- B) binds with the substrate like a lock and key.
- C) binds to other enzymes forming an enzymatic pathway.
- D) is inhibited by a coenzyme or a cofactor.
- E) none of the above

*Outcome: Students will be able to critically discuss the energy yielding, catabolic pathways of glycolysis and cellular respiration, and evaluate the significance of fermentation, and their significance to living organisms.*

Match these answers with the following questions.

- a. Reduced ATP production
- b. Carbon dioxide
- c. Oxygen (O<sub>2</sub>)
- d. Low oxygen or anaerobic conditions
- e. Convert food energy into ATP

57. What is the overall purpose of cellular respiration?

58. Under what conditions does lactic acid fermentation occur?

59. What molecule, other than food and water, is necessary for all the pathways of cellular respiration to continue to operate?

60. What is one of the consequences of lactic acid fermentation?

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61. Muscle cells in oxygen deprivation convert pyruvate to \_\_\_\_\_ .

- a. acetyl Co-enzyme A
- b. alcohol
- c. ATP
- d. CO<sub>2</sub>
- e. lactic acid

62. During cellular respiration, electrons travel downhill from

- a. food --- Krebs cycle --- ATP --- NAD<sup>+</sup>
- b. food --- NADH --- electron transport chain --- oxygen
- c. glucose --- ATP --- oxygen
- d. glucose --- ATP --- electron transport chain --- NADH
- e. food --- glycolysis --- Krebs cycle --- NADH --- ATP

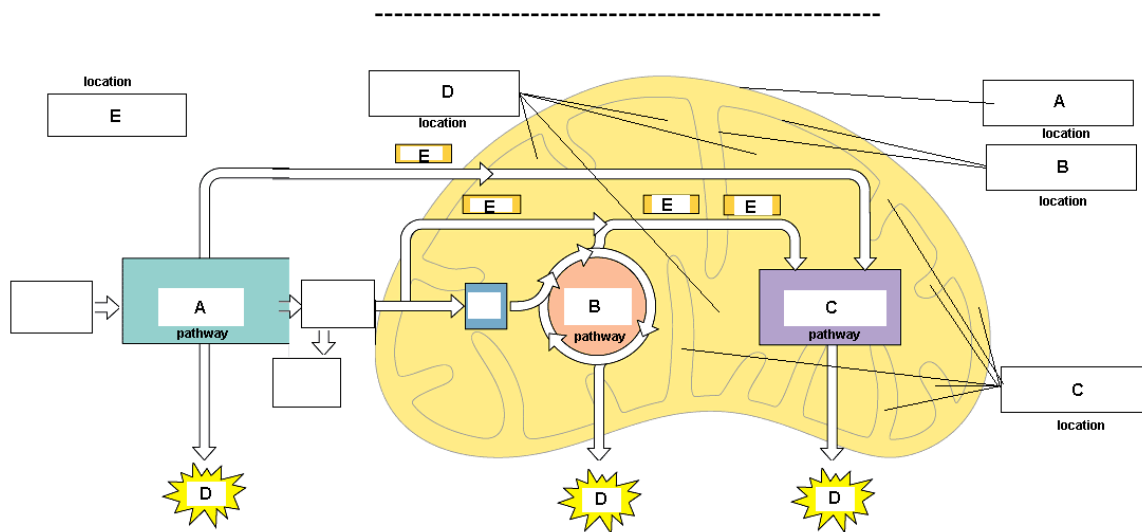
63) What is the term used for the metabolic pathways in which glucose is degraded to carbon dioxide and water?

- A) fermentation
- B) cellular respiration
- C) photosynthesis
- D) oxidative phosphorylation
- E) glycolysis

64) What are the pathways of cellular respiration?

- A) Calvin Cycle, Light Reaction and Fermentation
- B) Light Reaction and Calvin Cycle
- C) NADPH and ATP
- D) Glycolysis, Citric Acid Cycle and Oxidative Phosphorylation

- E) Mitosis, Endocytosis, and Exocytosis
- 65) Where inside the cell does glycolysis take place?
- cytosol (cytoplasm)
  - mitochondrial intermembrane space
  - mitochondrial outer membrane
  - mitochondrial inner membrane
  - mitochondrial matrix
- 66) Oxygen consumed during cellular respiration is involved directly in which process?
- the oxidation of pyruvate to acetyl CoA
  - glycolysis
  - accepting electrons at the end of the electron transport chain
  - the citric acid cycle
  - fermentation



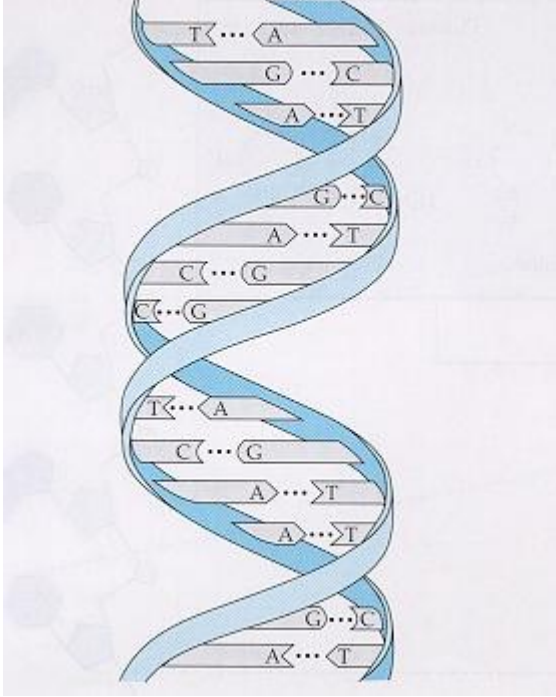
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Match the labels in the above with the following terms.

- \_\_\_ 67. Oxidative phosphorylation
- \_\_\_ 68. Citric Acid (Krebs) Cycle
- \_\_\_ 69. ATP
- \_\_\_ 70. NADH
- \_\_\_ 71. Inner membrane space
- \_\_\_ 72. location of the cytosol
- \_\_\_ 73. location with the highest pH during aerobic cellular respiration

- \_\_\_74. In addition to ATP, what are the end products of glycolysis?
- A) H<sub>2</sub>O and citrate
  - B) CO<sub>2</sub> and pyruvate
  - C) CO<sub>2</sub> and H<sub>2</sub>O
  - D) CO<sub>2</sub> and NADH
  - E) NADH and pyruvate
- \_\_\_75) A molecule that is phosphorylated
- A) has a decreased chemical reactivity; it is less likely to provide energy for cellular work.
  - B) has less energy than before its phosphorylation and therefore less energy for cellular work.
  - C) has been oxidized as a result of a redox reaction involving the gain of an inorganic phosphate.
  - D) has been reduced as a result of a redox reaction involving the loss of an inorganic phosphate.
  - E) has an increased chemical reactivity; it is primed to do cellular work.
- \_\_\_76) Cellular respiration harvests the most chemical energy from which of the following?
- A) substrate-level phosphorylation
  - B) chemiosmosis or oxidative phosphorylation
  - C) generating carbon dioxide and oxygen in the electron transport chain
  - D) converting oxygen to ATP
  - E) transferring electrons from organic molecules to pyruvate

\_\_\_77. Genes are made up of thousands of nucleotide in various sequences of A's, T's, C's, and G's. Write the nucleotide sequence of the portion of the gene shown in the box at right. Read the sequence starting at the top of the molecule on the right hand strand starting with "A." Be careful to follow the right strand as it coils around the left strand. Select the answer below that best represents the genetic code carried on the right strand reading from top to bottom

<p>a. ACTCTGGAGTTCT</p> <p>b. ACTGACCAGTTGA</p> <p>c. ACTAGTCTGGCCA</p> <p>d. AGTTGACCAGTCA</p> <p>e. ATCGATGCATGCC</p>	
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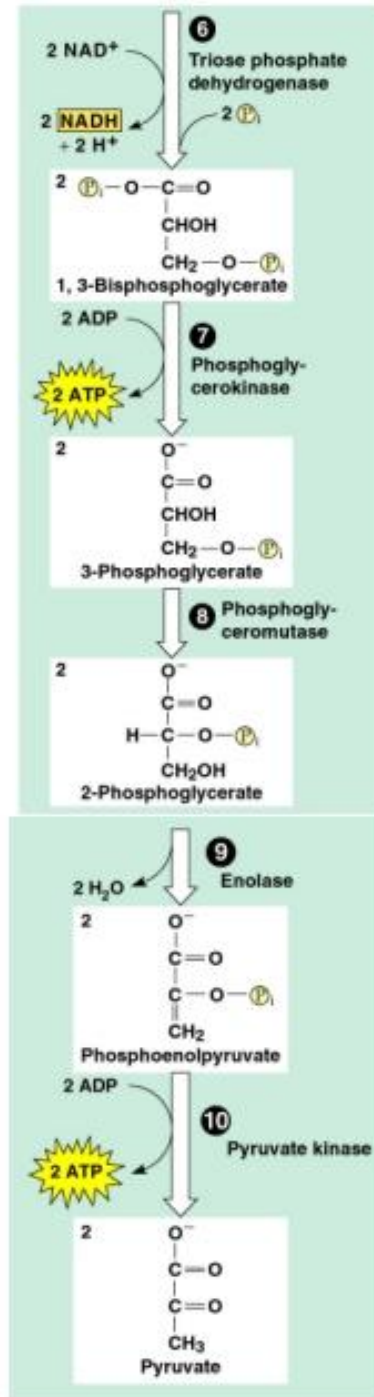
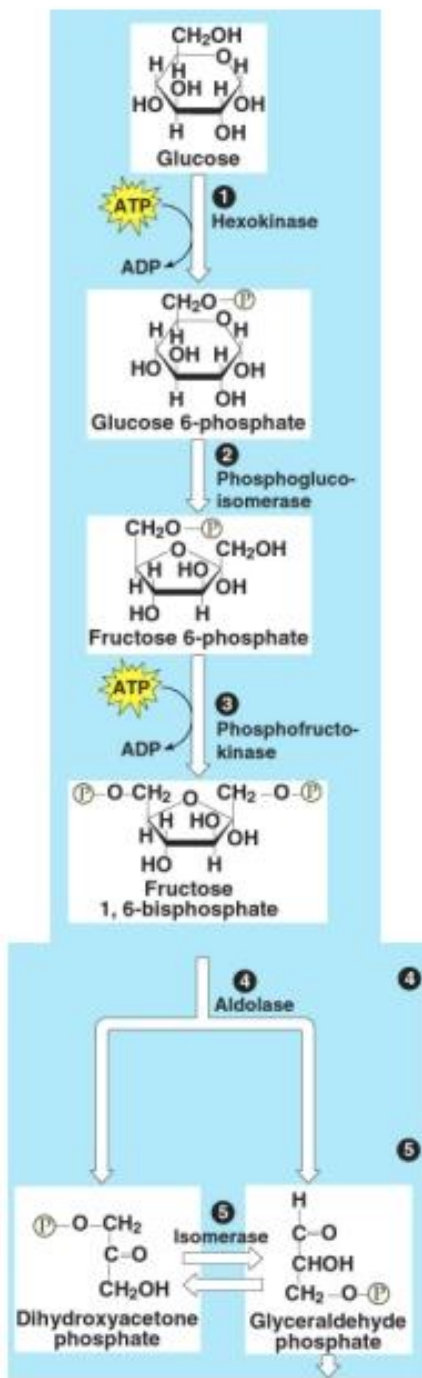
\_\_\_78) Which metabolic process is most closely associated with the inner mitochondrial membranes?

- A) substrate-level phosphorylation
- B) alcohol fermentation
- C) glycolysis
- D) the citric acid cycle
- E) oxidative phosphorylation

\_\_\_79) In oxidative phosphorylation, what is the most immediate (proximate) source of energy that is used to convert ADP + to ATP?

- A) energy released from ATP synthase pumping hydrogen ions against their concentration gradient
- B) energy released from movement of protons through ATP synthase
- C) energy released from substrate-level phosphorylation
- D) energy released as electrons flow through the electron transport chain
- E) No external source of energy is required because the reaction is exergonic.

- \_\_\_80) Where is ATP synthase located in the mitochondrion?
- A) inner membrane
  - B) electron transport chain
  - C) cytosol
  - D) mitochondrial matrix
  - E) outer membrane
- \_\_\_81) Which of the following normally occurs whether or not oxygen (O<sub>2</sub>) is present?
- A) fermentation
  - B) citric acid cycle
  - C) oxidation of pyruvate to acetyl CoA
  - D) glycolysis
  - E) oxidative phosphorylation (chemiosmosis)
- \_\_\_82) Muscle cells in oxygen deprivation convert pyruvate to
- A) ADP
  - B) ATP
  - C) alcohol
  - D) NADH
  - E) lactic acid
- \_\_\_83) Which pathway of cellular respiration produces the most ATP?
- A) fermentation
  - B) glycolysis
  - C) Calvin Cycle
  - D) Citric Acid Cycle
  - E) Oxidative Phosphorylation



84. Which step or steps above “invest” energy in the food molecule?

- A. 4 & 5
- B. 10
- C. 1 & 3
- D. 7 & 10
- E. 8

- \_\_\_ 85. Which step or steps above harvest energy from the food molecule?  
 A. 4 & 5  
 B. 10  
 C. 1 & 3  
 D. 6, 7 & 10  
 E. 9

\_\_\_ 86. Which location represents the innermembrane space?

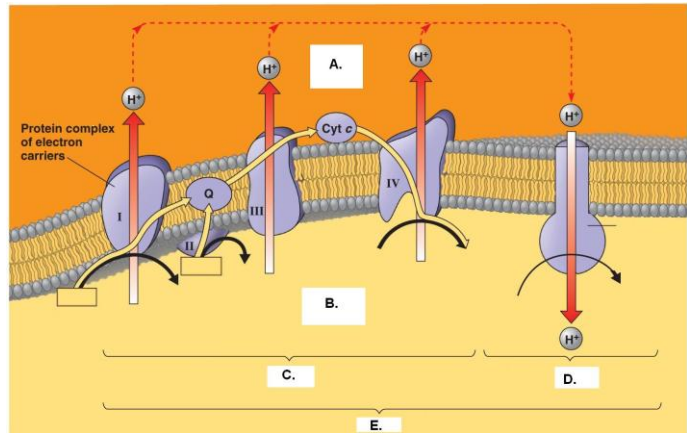
- A.  
 B.

\_\_\_ 87. Which process best represents the electron transport chain?

- C.  
 D.  
 E.

\_\_\_ 88. Which process represents chemiosmosis?

- C.  
 D.  
 E.

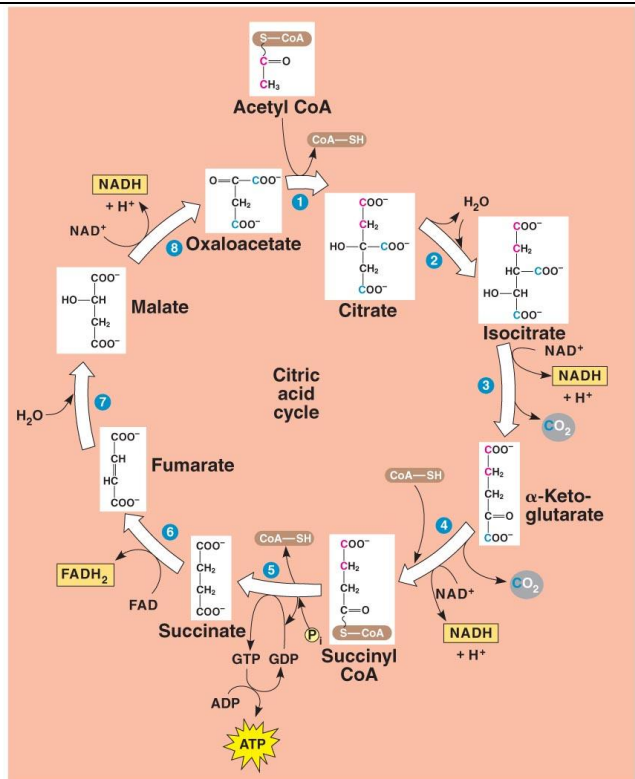


\_\_\_ 89. Which enzymatic step or steps remove electrons that are then shuttled to the electron transport chain?

- A. 1-2-4-7  
 B. 2-6  
 C. 1-6-7-8  
 D. 5  
 E. 3-4-6-8

\_\_\_ 90. Which step or steps are responsible for "substrate level phosphorylation?"

- A. 1-2-4-7  
 B. 2-6  
 C. 1-6-7-8  
 D. 5  
 E. 3-4-6-8



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