LEC 12 Q - METABOLISISM

1. **What is the primary product of glycolysis?**

   A) Acetyl CoA
   B) Pyruvate
   C) Lactate
   D) Ethanol

2. **How many ATP molecules are consumed during the preparation phase of glycolysis?**

   A) 1
   B) 2
   C) 4
   D) None

3. **Which phase of glycolysis produces ATP?**

   A) Preparation Phase
   B) Energy Payoff Phase
   C) Both phases
   D) Neither phase

4. **What is the role of 2,3-bisphosphoglycerate (2,3-BPG) in red blood cells?**

   A) Increases ATP production
   B) Enhances oxygen delivery to tissues
   C) Converts pyruvate to lactate
   D) Stabilizes the R-state of hemoglobin

5. **In which organ or tissue does the conversion of pyruvate to lactate primarily occur?**

   A) Lungs
   B) Liver
   C) Muscles
   D) Red blood cells

6. **What is the consequence of bypassing the ATP production step in the synthesis of 2,3-BPG?**

   A) Increased ATP yield
   B) Decreased ATP yield
   C) No effect on ATP levels
   D) Increased oxygen affinity of hemoglobin

7. **Which enzyme catalyzes the conversion of 1,3-bisphosphoglycerate to 2,3-bisphosphoglycerate?**

A) Phosphatase
B) Mutase
C) Kinase
D) Dehydrogenase

8. **What happens to pyruvate under anaerobic conditions?**

   A) It is converted to Acetyl CoA
   B) It is converted to lactate
   C) It enters the Krebs cycle
   D) It is used in gluconeogenesis

9. **Which metabolic state is most likely to cause lactic acidosis?**

   A) Hyperoxia
   B) Hypoxia
   C) Normoxia
   D) Aerobic respiration

10. **Which of the following factors can lead to increased lactate production?**

    A) Increased gluconeogenesis
    B) Decreased oxygen transport
    C) Enhanced oxidative phosphorylation
    D) Increased pyruvate dehydrogenase activity

Answers

1. B
2. B
3. B
4. B
5. D
6. B
7. B
8. B
9. B
10. B

11. **What is the net gain of ATP molecules per glucose molecule during glycolysis?**

    A) 0
    B) 1
    C) 2
    D) 4

12. **Which of the following conditions can lead to lactate production in muscle cells?**

13. A) Adequate oxygen supply
    B) Intense exercise
    C) Low energy demand
    D) Normal aerobic metabolism
14. **What role does the enzyme lactate dehydrogenase play in anaerobic respiration?**

    A) Converts acetaldehyde to ethanol
    B) Reduces pyruvate to lactate
    C) Converts lactate back to pyruvate
    D) Increases ATP production

15. **What is the effect of 2,3-BPG binding to hemoglobin?**

    A) Increases oxygen binding affinity
    B) Stabilizes the R-state of hemoglobin
    C) Stabilizes the T-state of hemoglobin
    D) Increases ATP production in RBCs

16. **Which metabolic pathway does pyruvate enter when oxygen is limited?**

    A) Krebs cycle
    B) Anaerobic respiration
    C) Gluconeogenesis
    D) Fatty acid oxidation

17. **What happens to 2,3-BPG after it fulfills its role in oxygen delivery?**

    A) It is excreted from the cell
    B) It is converted back to pyruvate
    C) It is dephosphorylated to form 3-phosphoglycerate
    D) It binds more tightly to hemoglobin

18. **Under which condition does the enzyme pyruvate dehydrogenase become less active, affecting ATP production?**

    A) High oxygen levels
    B) High lactate levels
    C) Low oxygen levels
    D) High glucose levels

19. **What is the primary consequence of lactic acidosis in the body?**

    A) Increased ATP production
    B) Decreased plasma pH
    C) Increased gluconeogenesis
    D) Enhanced oxidative phosphorylation

20. **In which specific tissues does the diversion of glycolysis to produce 2,3-BPG primarily occur?**

A) Brain
B) Heart
C) Red blood cells
D) Liver

21. **Which of the following factors contributes to the development of lactic acidosis due to hypoxia?**

    A) Increased aerobic respiration
    B) Decreased NADH levels
    C) Impaired oxidative metabolism
    D) Increased pyruvate carboxylase activity

Answers

11. C
12. B
13. B
14. C
15. B
16. C
17. C
18. B
19. C
20. C

21. **What metabolic fate does pyruvate undergo when it is converted to Acetyl CoA?**

    A) It enters the Krebs cycle
    B) It is converted to lactate
    C) It is transformed into glucose
    D) It is reduced to ethanol

22. **Which condition is characterized by an increased reliance on anaerobic respiration?**

    A) High aerobic activity
    B) Low oxygen availability
    C) High blood pH
    D) Abundant energy supply

23. **What is the role of NADH in the conversion of pyruvate to lactate?**

    A) It is produced during the reaction
    B) It is oxidized to NAD^+
    C) It increases ATP production
    D) It stabilizes hemoglobin

24. **Which enzyme is responsible for converting pyruvate to acetaldehyde in yeast fermentation?**

    A) Alcohol dehydrogenase
    B) Lactate dehydrogenase
    C) Pyruvate decarboxylase
    D) Pyruvate kinase

25. **In what state does hemoglobin exist when it has a lower affinity for oxygen?**

    A) R-state
    B) T-state
    C) S-state
    D) Z-state

26. **What triggers the release of lactate during intense exercise?**

    A) Decreased glucose availability
    B) Increased oxygen availability
    C) Increased energy demand
    D) Decreased ATP levels

27. **What happens to the phosphate group in 2,3-BPG during its conversion back to 3-phosphoglycerate?**

    A) It is added to ADP
    B) It is transferred to glucose
    C) It is removed by a phosphatase enzyme
    D) It is converted to lactate

28. **Which factor can lead to decreased gluconeogenesis, contributing to lactic acidosis?**

    A) Increased oxygen supply
    B) Elevated lactate levels
    C) Enhanced Krebs cycle activity
    D) High pyruvate dehydrogenase activity

29. **What is the effect of respiratory failure on lactate levels?**

    A) It decreases lactate production
    B) It has no effect on lactate production
    C) It increases lactate production
    D) It converts lactate back to pyruvate

30. **Where in the body does the synthesis of 2,3-BPG primarily occur?**

    A) Lungs
    B) Red blood cells

C) Liver
D) Muscle cells

Answers

21. A
22. B
23. B
24. C
25. B
26. C
27. C
28. B
29. C
30. B

31. **Which of the following statements accurately describes the ATP dynamics in glycolysis?**

    A) 4 ATP are produced and 2 ATP are consumed, resulting in a net gain of 4 ATP.
    B) 4 ATP are produced with no consumption, leading to a net gain of 4 ATP.
    C) 2 ATP are produced and 2 ATP are consumed, resulting in a net gain of 2 ATP.
    D) No ATP is produced or consumed during glycolysis.

32. **What specific mechanism allows 2,3-BPG to facilitate oxygen release in peripheral tissues?**

    A) It binds to the R-state of hemoglobin, enhancing oxygen affinity.
    B) It stabilizes the T-state of hemoglobin, reducing its affinity for oxygen.
    C) It directly converts oxygen to a more reactive form.
    D) It competes with oxygen for binding sites on hemoglobin.

33. **In what way does the metabolic conversion of pyruvate to lactate regenerate NAD^+, and why is this important?**

    A) It oxidizes NADH, allowing glycolysis to continue under anaerobic conditions.
    B) It produces NADH, which inhibits glycolysis.
    C) It reduces NAD^+, preventing lactate accumulation.
    D) It generates ATP, making NAD^+ redundant.

34. **Which of the following conditions does NOT contribute to increased lactate levels in the body?**

    A) Hypoxia
    B) High levels of NADH from alcohol metabolism
    C) Increased gluconeogenesis
    D) Impaired oxidative phosphorylation

35. **How does the presence of 2,3-BPG in red blood cells affect the efficiency of glycolysis?**

A) It enhances ATP production directly.
B) It diverts glucose-6-phosphate to lactate.
C) It bypasses an ATP-producing step, leading to decreased ATP yield.
D) It has no effect on glycolytic efficiency.

36. **Which enzymatic activity is crucial for the conversion of pyruvate to oxaloacetate, and what is its significance?**

A) Pyruvate kinase; it decreases energy production.
B) Pyruvate carboxylase; it is important for gluconeogenesis.
C) Lactate dehydrogenase; it prevents lactate buildup.
D) Acetaldehyde dehydrogenase; it promotes aerobic respiration.

37. **What is the physiological significance of the reversible conversion of pyruvate to lactate in muscle cells?**

A) It allows for increased ATP synthesis in aerobic conditions.
B) It provides a rapid source of energy when oxygen is scarce.
C) It inhibits glycolysis during low energy demand.
D) It enhances the storage of glycogen.

38. **Which of the following correctly describes the relationship between 2,3-BPG and hemoglobin states during gas exchange in the lungs versus peripheral tissues?**

A) 2,3-BPG stabilizes the R-state in the lungs for increased oxygen binding.
B) 2,3-BPG is absent in peripheral tissues where hemoglobin is in the T-state.
C) In the lungs, hemoglobin shifts to the R-state, reducing 2,3-BPG's role.
D) 2,3-BPG promotes the T-state in the lungs for optimal gas exchange.

39. **What is the main consequence of impaired O_2 transport due to hemoglobin disorders on lactate levels?**

A) Decreased lactate production due to improved aerobic metabolism.
B) Increased lactate production due to reliance on anaerobic pathways.
C) Stabilization of lactate levels regardless of metabolic conditions.
D) Inhibition of glycolysis due to elevated ATP levels.

40. **What key role does the enzyme phosphatase play in the glycolytic pathway involving 2,3-BPG?**

A) It catalyzes the conversion of lactate back to pyruvate.
B) It converts 2,3-BPG to 3-phosphoglycerate, allowing glycolysis to continue.
C) It enhances the production of ATP during glycolysis.
D) It stabilizes 2,3-BPG in the T-state of hemoglobin.

Answers

31. C
32. B
33. A
34. C
35. C
36. B
37. B
38. C
39. B
40. B

41. **Which specific step in glycolysis involves the consumption of ATP, leading to substrate-level phosphorylation?**

    A) Glucose → Glucose-6-Phosphate
    B) 1,3-Bisphosphoglycerate → 3-Phosphoglycerate
    C) Phosphoenolpyruvate → Pyruvate
    D) Fructose-6-Phosphate → Fructose-1,6-Bisphosphate

42. **What is the effect of lactate accumulation in red blood cells, particularly in terms of energy metabolism?**

    A) It enhances glycolysis due to increased ATP levels.
    B) It signals a shift to aerobic metabolism.
    C) It facilitates continued ATP production despite low mitochondrial function.
    D) It decreases glycolytic flux and ATP production.

43. **How does pyruvate decarboxylation to acetaldehyde in yeast differ from its conversion to acetyl CoA in aerobic conditions?**

    A) Pyruvate decarboxylation is irreversible, while conversion to acetyl CoA is reversible.
    B) Pyruvate decarboxylation produces ATP, while conversion to acetyl CoA does not.
    C) Decarboxylation releases CO_2, while conversion to acetyl CoA does not involve CO_2 release.
    D) Both processes occur in the mitochondria.

44. **What role does conformational change in hemoglobin play in oxygen delivery to tissues?**

    A) It reduces hemoglobin's ability to release CO_2.
    B) It increases oxygen affinity in peripheral tissues.
    C) It enhances the release of oxygen by stabilizing the T-state.
    D) It converts deoxyhemoglobin to oxyhemoglobin upon oxygen binding.

45. **In terms of metabolic fate, which pathway becomes prominent under conditions of lactic acidosis?**

    A) Glycogenolysis
    B) Oxidative phosphorylation
    C) Gluconeogenesis
    D) Anaerobic respiration

46. **Which condition would lead to a direct decrease in pyruvate dehydrogenase activity?**

    A) Increased NADH levels
    B) Increased levels of Acetyl CoA
    C) Hypoxia
    D) Both A and B

47. **How does the activity of the mutase enzyme influence glycolytic efficiency in red blood cells?**

    A) It directly increases ATP production by recycling ADP.
    B) It diverts energy from ATP production to facilitate oxygen delivery.
    C) It enhances the conversion of glucose to lactate.
    D) It stabilizes the R-state of hemoglobin, increasing oxygen affinity.

48. **Which of the following is a key regulatory point in the metabolic fate of pyruvate?**

    A) Conversion to lactate by lactate dehydrogenase
    B) Decarboxylation to acetaldehyde
    C) Carboxylation to oxaloacetate
    D) All of the above

49. **What impact does a deficiency in TCA cycle enzymes have on lactate production?**

    A) It decreases lactate production due to reduced glycolytic flux.
    B) It increases lactate production by promoting anaerobic respiration.
    C) It has no effect on lactate production.
    D) It shifts metabolism towards gluconeogenesis.

50. **In the context of lactic acidosis, what is the primary physiological consequence of elevated lactate levels?**

    A) Enhanced ATP production
    B) Metabolic alkalosis
    C) Decreased pH and potential metabolic acidosis
    D) Increased glucose synthesis

Answers

41. D
42. C
43. C
44. C
45. D
46. D
47. B
48. D
49. B
50. C

51. **Which step in the glycolytic pathway is responsible for the production of NADH?**

    A) Glucose to Glucose-6-Phosphate
    B) 1,3-Bisphosphoglycerate to 3-Phosphoglycerate
    C) Glyceraldehyde-3-Phosphate to 1,3-Bisphosphoglycerate
    D) Phosphoenolpyruvate to Pyruvate

52. **In what manner does 2,3-BPG facilitate enhanced oxygen delivery during conditions of hypoxia?**

    A) By increasing the production of ATP in red blood cells
    B) By promoting the transition of hemoglobin to the R-state
    C) By stabilizing the T-state of hemoglobin, reducing oxygen affinity
    D) By increasing the rate of glycolysis

53. **Which metabolic pathway is primarily utilized by red blood cells due to their lack of mitochondria?**

    A) Krebs cycle
    B) Anaerobic respiration
    C) Oxidative phosphorylation
    D) Fatty acid oxidation

54. **What mechanism prevents lactate from accumulating excessively in muscles during anaerobic conditions?**

    A) Conversion back to pyruvate when oxygen is available
    B) Enhanced gluconeogenesis in the liver
    C) Direct conversion to acetyl CoA
    D) Increased ATP production

55. **Which physiological response occurs in the lungs when hemoglobin transitions from the T-state to the R-state?**

    A) Decreased oxygen uptake
    B) Increased affinity for oxygen

C) Stabilization of 2,3-BPG binding
D) Enhanced release of carbon dioxide

56. **What is the consequence of excessive alcohol consumption on metabolic pathways, particularly regarding lactate levels?**

A) It decreases NADH levels, reducing lactate production.
B) It increases NADH, inhibiting the Krebs cycle and promoting lactate formation.
C) It enhances the efficiency of oxidative phosphorylation.
D) It has no effect on lactate levels.

57. **How does pyruvate carboxylation to oxaloacetate contribute to gluconeogenesis?**

A) It generates ATP, fueling gluconeogenesis.
B) It provides a substrate for the synthesis of glucose.
C) It diverts lactate away from energy production.
D) It inhibits the conversion of lactate to glucose.

58. **Which statement best describes the relationship between ATP production and 2,3-BPG synthesis in red blood cells?**

A) Increased 2,3-BPG synthesis correlates with increased ATP production.
B) 2,3-BPG synthesis diverts ATP production, leading to a net loss of ATP.
C) ATP production is unaffected by 2,3-BPG levels.
D) 2,3-BPG enhances ATP production directly.

59. **What condition is indicated by a reduction in blood plasma pH below 7.4 due to elevated lactate levels?**

A) Lactic acidosis
B) Metabolic alkalosis
C) Respiratory acidosis
D) Normoglycemia

60. **Which factor is crucial for maintaining lactate homeostasis during conditions of tissue hypoxia?**

A) Enhanced oxidative phosphorylation
B) Efficient recycling of NAD^+
C) Increased production of acetyl CoA
D) Direct conversion of lactate to glucose in the muscles

Answers

51. C
52. C
53. B
54. A

55. B
56. B
57. B
58. B
59. A
60. B

61. **Which enzyme is primarily responsible for the conversion of 1,3-bisphosphoglycerate to 2,3-bisphosphoglycerate in red blood cells?**

    A) Pyruvate kinase
    B) Phosphoglycerate kinase
    C) Mutase
    D) Lactate dehydrogenase

62. **What is the primary reason why red blood cells rely exclusively on anaerobic respiration?**

    A) They have abundant mitochondria for oxidative phosphorylation.
    B) They require high ATP yields from glycolysis.
    C) They lack mitochondria for aerobic respiration.
    D) They produce less lactate than other cells.

63. **Which metabolic pathway is impaired in conditions of lactic acidosis due to reduced gluconeogenesis?**

    A) Anaerobic respiration
    B) Glycogenolysis
    C) Lipid metabolism
    D) Protein synthesis

64. **What is the role of lactate dehydrogenase in anaerobic respiration?**

    A) It converts pyruvate to acetyl CoA.
    B) It reduces lactate back to pyruvate when oxygen is available.
    C) It catalyzes the conversion of pyruvate to lactate, regenerating NAD^+.
    D) It facilitates the oxidation of NADH to NAD^+ without producing lactate.

65. **What is the impact of high NADH levels from alcohol metabolism on cellular respiration?**

    A) It promotes ATP synthesis via oxidative phosphorylation.
    B) It enhances the Krebs cycle activity.
    C) It inhibits pyruvate dehydrogenase and shifts metabolism to lactate production.
    D) It increases glucose uptake in cells.

66. **In what way does the metabolic fate of pyruvate differ between aerobic and anaerobic conditions?**

A) In aerobic conditions, pyruvate is always converted to ethanol.
B) In anaerobic conditions, pyruvate is converted to acetyl CoA.
C) In aerobic conditions, pyruvate enters the Krebs cycle, while in anaerobic conditions, it is converted to lactate or ethanol.
D) Both conditions result in the same metabolic products.

67. **Which physiological condition directly increases the demand for 2,3-BPG in red blood cells?**

A) Decreased energy expenditure
B) High altitudes and hypoxia
C) Aerobic exercise
D) High oxygen levels

68. **What consequence does the stabilization of hemoglobin in the T-state have on oxygen affinity?**

A) It increases hemoglobin's affinity for oxygen.
B) It decreases hemoglobin's affinity for oxygen, facilitating oxygen release.
C) It has no effect on oxygen binding.
D) It enhances the binding of CO_2 to hemoglobin.

69. **Which of the following metabolic processes becomes more significant when cells are subjected to conditions of hypoxia?**

A) Oxidative phosphorylation
B) Glycolysis
C) Gluconeogenesis
D) Fatty acid oxidation

70. **How does the enzymatic activity of phosphatase influence 2,3-BPG in red blood cells?**

A) It synthesizes 2,3-BPG from 1,3-bisphosphoglycerate.
B) It removes a phosphate group, converting 2,3-BPG back to 3-phosphoglycerate, facilitating glycolysis.
C) It inhibits the formation of 2,3-BPG during glycolysis.
D) It increases ATP production by recycling phosphate groups.

Answers

61. C
62. C
63. D
64. C
65. C
66. C
67. B
68. B
69. B

70. B

71. **What is the primary role of pyruvate in the context of cellular metabolism?**

A) It is solely a waste product of glycolysis.
B) It serves as a substrate for both aerobic and anaerobic pathways, influencing energy production.
C) It exclusively enters the gluconeogenesis pathway.
D) It inhibits glycolysis under anaerobic conditions.

72. **Which of the following statements correctly describes the impact of 2,3-BPG on hemoglobin's oxygen affinity?**

A) 2,3-BPG increases hemoglobin's oxygen affinity, promoting oxygen uptake.
B) 2,3-BPG decreases hemoglobin's oxygen affinity, enhancing oxygen delivery to tissues.
C) 2,3-BPG has no effect on hemoglobin's oxygen affinity.
D) 2,3-BPG stabilizes the R-state of hemoglobin, increasing its affinity for oxygen.

73. **What metabolic consequence occurs in red blood cells when there is a lack of 2,3-BPG?**

A) Increased oxygen affinity of hemoglobin, leading to reduced oxygen delivery.
B) Enhanced lactate production due to increased glycolysis.
C) Decreased ATP production from glycolysis.
D) Inhibition of anaerobic respiration.

74. **Which of the following factors is a primary contributor to lactic acidosis?**

A) Enhanced oxidative phosphorylation in tissues
B) Increased production of lactate due to impaired aerobic metabolism
C) Elevated levels of glucose in the bloodstream
D) Decreased pyruvate levels in the body

75. **Which enzyme is crucial for the conversion of pyruvate to acetyl CoA and plays a significant role in aerobic metabolism?**

A) Lactate dehydrogenase
B) Pyruvate carboxylase
C) Pyruvate dehydrogenase
D) Alcohol dehydrogenase

76. **In which condition would lactate production predominantly increase in muscle cells?**

A) During resting metabolic activity
B) Under conditions of high oxygen availability
C) During intense exercise when oxygen supply is insufficient
D) When glucose levels are low

77. **What physiological change occurs in red blood cells during intense exercise regarding energy production?**

A) Shift from anaerobic to aerobic metabolism
B) Increased reliance on glycolysis and lactate production due to low oxygen
C) Enhanced glucose uptake leading to greater ATP yield
D) Decreased production of NADH

78. **How does the enzymatic reaction of pyruvate to lactate benefit cellular metabolism during low oxygen conditions?**

A) It decreases NAD^+ levels, inhibiting glycolysis.
B) It generates ATP, providing energy for cellular functions.
C) It regenerates NAD^+, allowing glycolysis to continue despite the lack of oxygen.
D) It diverts pyruvate away from lactate to produce glucose.

79. **Which mechanism ensures that pyruvate can be converted back to glucose when oxygen becomes available?**

A) Increased activity of lactate dehydrogenase
B) Enhanced gluconeogenesis in the liver
C) Reduced reliance on anaerobic pathways
D) Activation of the Krebs cycle

80. **What is the ultimate effect of 2,3-BPG on oxygen delivery during conditions of high metabolic demand?**

A) It decreases oxygen delivery to tissues.
B) It enhances oxygen release from hemoglobin to tissues.
C) It stabilizes hemoglobin in the R-state, promoting oxygen binding.
D) It inhibits glycolysis to conserve energy.

Answers

71. B
72. B
73. A
74. B
75. C
76. C
77. B
78. C
79. B
80. B

81. **What is the consequence of bypassing the ATP-producing step in the glycolytic pathway within red blood cells?**

A) Increased production of 2,3-BPG
B) Enhanced energy yield from glycolysis
C) Decreased ATP levels but improved oxygen delivery
D) Increased conversion of glucose to pyruvate

82. **Which of the following correctly describes the relationship between lactate production and energy demands in muscle cells?**

A) Lactate production increases during low energy demand.
B) Lactate is produced when oxygen supply exceeds demand.
C) High energy demand, such as during intense exercise, leads to increased lactate production due to anaerobic respiration.
D) Lactate production occurs exclusively in red blood cells.

83. **How does the presence of high NADH levels affect the conversion of pyruvate to lactate?**

A) It promotes the conversion of lactate back to pyruvate.
B) It enhances lactate production by shifting the equilibrium toward lactate formation.
C) It has no impact on lactate levels.
D) It inhibits lactate dehydrogenase activity.

84. **Which pathway is activated when oxygen levels are restored after anaerobic respiration in muscle cells?**

A) Glycolysis
B) The Krebs cycle
C) Lactic acid fermentation
D) Gluconeogenesis

85. **What is the primary function of the pyruvate dehydrogenase complex in aerobic metabolism?**

A) To convert pyruvate into lactate for energy production
B) To catalyze the conversion of pyruvate to acetyl CoA, linking glycolysis to the Krebs cycle
C) To increase NADH production from pyruvate
D) To inhibit the activity of the TCA cycle

86. **Which of the following accurately describes the role of 2,3-BPG in oxygen transport?**

A) It decreases the release of oxygen from hemoglobin.
B) It stabilizes the R-state of hemoglobin, increasing oxygen affinity.

C) It promotes the release of oxygen by stabilizing the T-state of hemoglobin.
D) It enhances ATP production from glycolysis.

87. **What physiological effect does lactic acidosis have on blood pH?**

A) It increases blood pH, causing alkalosis.
B) It has no effect on blood pH.
C) It decreases blood pH, leading to metabolic acidosis.
D) It stabilizes blood pH at neutral levels.

88. **In the context of anaerobic conditions, what is the fate of the NADH produced during glycolysis?**

A) It is converted back to glucose.
B) It is oxidized to NAD^+ by lactate production, allowing glycolysis to continue.
C) It accumulates and inhibits glycolysis.
D) It is utilized in the Krebs cycle for ATP production.

89. **Which metabolic process is primarily responsible for the production of 2,3-BPG in red blood cells?**

A) The conversion of glucose to lactate
B) The conversion of 1,3-bisphosphoglycerate to 2,3-BPG via mutase
C) The glycolytic conversion of pyruvate to acetyl CoA
D) The breakdown of hemoglobin

90. **How does the body compensate for reduced aerobic energy production in conditions of hypoxia?**

A) By increasing reliance on oxidative phosphorylation
B) By enhancing aerobic glycolysis
C) By switching to anaerobic respiration, increasing lactate production
D) By reducing energy demands

Answers

81. C
82. C
83. B
84. B
85. B
86. C
87. C
88. B
89. B
90. C

91. **What role does the enzyme phosphoglycerate kinase (PGK) play in glycolysis?**

A) It converts glucose to glucose-6-phosphate.
B) It catalyzes the conversion of 1,3-bisphosphoglycerate to 3-phosphoglycerate, producing ATP.
C) It facilitates the conversion of pyruvate to acetyl CoA.
D) It is responsible for the synthesis of 2,3-BPG.

92. **Which statement about glycolysis is correct?**

A) It exclusively occurs in the mitochondria.
B) It requires oxygen for ATP production.
C) It can occur under both aerobic and anaerobic conditions.
D) It produces only NADH as an energy carrier.

93. **During intense physical activity, which mechanism helps to manage increased lactate levels?**

A) Increased gluconeogenesis in the liver
B) Lactate conversion back to pyruvate when oxygen is available
C) Enhanced mitochondrial respiration
D) Decreased glycolysis

94. **What is the consequence of a mutation in the pyruvate dehydrogenase complex?**

A) Decreased production of 2,3-BPG
B) Impaired conversion of pyruvate to acetyl CoA, affecting energy production
C) Increased lactate production under aerobic conditions
D) Enhanced glycolysis

95. **What condition triggers the synthesis of 2,3-BPG in red blood cells?**

A) High blood glucose levels
B) Low oxygen availability (hypoxia)
C) High ATP concentrations
D) Increased mitochondrial activity

96. **Which factor can lead to a significant increase in lactate production in the body?**

A) High levels of oxygen availability
B) Increased glucose levels in the bloodstream
C) Anaerobic metabolism during strenuous exercise
D) Enhanced oxidative phosphorylation

97. **What happens to lactate produced during anaerobic respiration when oxygen becomes available again?**

A) It is excreted from the body.
B) It is converted back to pyruvate and can enter the Krebs cycle.

C) It accumulates indefinitely in tissues.
D) It directly inhibits glycolysis.

98. **Which enzyme is primarily responsible for the conversion of acetaldehyde to ethanol in yeast?**

A) Pyruvate dehydrogenase
B) Lactate dehydrogenase
C) Alcohol dehydrogenase
D) Aldolase

99. **What is a key physiological effect of the binding of 2,3-BPG to deoxyhemoglobin?**

A) Decreased oxygen release to tissues
B) Increased affinity for oxygen
C) Stabilization of the T-state, facilitating oxygen release
D) Enhanced ATP production

100. **In which scenario would you expect an increase in pyruvate production?**

A) During prolonged fasting
B) When cells are actively utilizing glucose for energy
C) Under conditions of oxygen deprivation
D) When the Krebs cycle is functioning optimally

Answers

91. B
92. C
93. B
94. B
95. B
96. C
97. B
98. C
99. C
100. B