

- 1. ATP**
 - a. can be produced by photosynthesis.
 - b. is produced in the degradation of organic compounds such as glucose.
 - c. is generated in anaerobic respiration.
 - d. is released in aerobic respiration.
 - e. all of these
- 2. The greatest number of ATP molecules is produced in**
 - a. glycolysis.
 - b. alcoholic fermentation.
 - c. anaerobic electron transport.
 - d. electron transport phosphorylation.
 - e. the Krebs cycle.
- 3. Before a glucose molecule can be broken down to release energy**
 - a. one ATP molecule must phosphorylate the six carbon sugar.
 - b. two ATP molecules must phosphorylate the six carbon sugar.
 - c. three ATP molecules must phosphorylate the six carbon sugar.
 - d. one ATP molecule must be taken away from glucose.
 - e. two ATP molecules must be taken away from glucose.
- 4. How many ATP molecules (net yield) are produced per molecule of glucose degraded during glycolysis?**
 - a. 1
 - b. 2
 - c. 4
 - d. 36
 - e. 38
- 5. In the breakdown of glucose, the compound formed after two phosphorylation reactions is split into two three-carbon compounds. The three-carbon compound is named**
 - a. phosphoglyceraldehyde (PGAL).
 - b. pyruvate.
 - c. acetyl CoA.
 - d. lactate.
 - e. acetaldehyde.
- 6. To break down a glucose molecule completely requires how many passes through the Krebs cycle?**
 - a. 2
 - b. 3
 - c. 4
 - d. 6
 - e. 12
- 7. The first stable intermediate produced in the Krebs cycle is**
 - a. pyruvate.
 - b. acetyl CoA.
 - c. fructose bisphosphate.
 - d. oxaloacetate.
 - e. citrate.
- 8. The last intermediate produced in the Krebs cycle is**
 - a. pyruvate.
 - b. acetyl CoA.
 - c. fructose bisphosphate.
 - d. oxaloacetate.
 - e. citrate.

9. Which process is a transition from glycolysis to the Krebs cycle?
- acetyl CoA formation
 - conversion of PGAL to PGA
 - regeneration of reduced NAD^+
 - oxidative phosphorylation
 - substrate-level phosphorylation
10. When glucose is used as the energy source, the largest amount of ATP is produced in
- glycolysis.
 - acetyl CoA formation.
 - the Krebs cycle.
 - substrate-level phosphorylation.
 - electron transport phosphorylation.
11. What is the name of the process by which NADH transfers electrons to oxygen?
- glycolysis
 - acetyl CoA formation
 - the Krebs cycle
 - electron transport phosphorylation
 - substrate-level phosphorylation
12. During electron transport phosphorylation, which ions accumulate in the outer compartment of the mitochondria?
- calcium
 - hydrogen
 - oxygen
 - phosphorus
 - sodium
13. The ultimate electron acceptor in aerobic respiration is
- NAD^+ .
 - CO_2 .
 - ADP.
 - NADP^+ .
 - O_2 .
14. How many ATPs typically form during the third stage of aerobic respiration?
- 0
 - 2
 - 4
 - 32
 - 36
15. The first forms of life that produced ATP probably used pathways similar to
- photosynthesis.
 - photophosphorylation.
 - glycolysis and fermentation.
 - the Krebs cycle.
 - aerobic respiration.
16. Under anaerobic conditions, muscle cells produce
- ethyl alcohol.
 - acetaldehyde.
 - pyruvate.
 - lactate.
 - citrate.
17. Sour cream and sour milk are produced by bacteria that form
- ethyl alcohol.
 - acetaldehyde.
 - pyruvate.
 - lactate.
 - citrate.

18. Fermentation

- a. may occur in a muscle under anaerobic conditions.
- b. produces more ATP than is liberated in the hydrogen transfer series.
- c. breaks down glucose in reaction with oxygen.
- d. is restricted to yeasts.
- e. none of these

19. If you were searching for anaerobic bacteria, you would NOT look for them in

- a. the guts of farm animals.
- b. swamps.
- c. mountain streams.
- d. sediments of lakes and oceans.
- e. sealed canned goods.

20. Lactate (lactic acid) production in muscle cells

- a. is temporary.
- b. is due to oxygen deficiency.
- c. is an NAD regenerator.
- d. is temporary and is due to oxygen deficiency.
- e. is temporary, is due to oxygen deficiency, and regenerates NAD.

21. Lactic acid fermentation is seen in

- a. fast twitch muscle fibers.
- b. slow twitch muscle fibers.
- c. intermediate twitch muscle fibers.
- d. both fast and intermediate fibers.
- e. all three fiber types.

22. When blood glucose levels decrease (as between meals), what reserves are tapped?

- a. glycogen
- b. fats
- c. proteins
- d. steroids
- e. amino acids

23. Glucose is converted into glycogen in the

- a. brain.
- b. muscles.
- c. liver.
- d. brain and liver.
- e. muscles and liver.

24. Glucagon prompts what organ(s) to convert glycogen to glucose?

- a. brain
- b. liver
- c. muscles
- d. brain and muscles
- e. brain and liver

25. Glycogen makes up what percentage of a human's energy reserves?

- a. 0.1%
- b. 1%
- c. 10%
- d. 50%
- e. 99%

26. When proteins and fats are used as energy sources, their breakdown subunits enter

- a. glycolysis.
- b. electron transport.
- c. the Krebs cycle.
- d. chemiosmosis.
- e. fermentation.

27. Which of the following is not a hydrogen acceptor?

- a. oxygen
- b. cytochrome
- c. ATP
- d. NAD^+
- e. FAD

28. Which compounds is not associated with anaerobic pathways?

- a. pyruvate
- b. lactic acid
- c. ethanol
- d. oxaloacetic acid
- e. phosphoglyceraldehyde (PGAL)

29. Which compound is not part of the glycolysis reactions?

- a. fructose-1,6-bisphosphate
- b. 3-phosphoglycerate (3-PGA)
- c. pyruvate
- d. phosphoenol pyruvate (PEP)
- e. isocitrate

30. Which process below is not part of the degradation processes for carbon compounds?

- a. Calvin-Benson cycle
- b. Krebs cycle
- c. fermentation
- d. respiration
- e. glycolysis

Choose the one most appropriate answer for each.

- a. produces NADH and CO_2 ; changes pyruvate
- b. produces ATP , NADH , and CO_2
- c. splits glucose into two pyruvate molecules
- d. regenerates NAD^+ as pyruvate is converted to ethanol or lactate
- e. uses a membrane-bound system that contains cytochromes to produce ATP

51. glycolysis

52. fermentation

53. acetyl-CoA formation

54. the Krebs cycle

55. electron transfer phosphorylation

Use the five processes listed below to answer questions.

- a. glycolysis
- b. aerobic respiration
- c. anaerobic electron transport
- d. alcoholic fermentation
- e. lactate fermentation

56. This process yields two molecules of ATP and the final product ethanol.

57. This process yields a final product called lactate.

58. This process yields the most energy.

59. This process involves electron transfer phosphorylation.

60. This process precedes the Krebs cycle.

Use the five compounds listed below to answer questions.

- a. ethanol
- b. pyruvate
- c. lactate
- d. citrate
- e. acetaldehyde

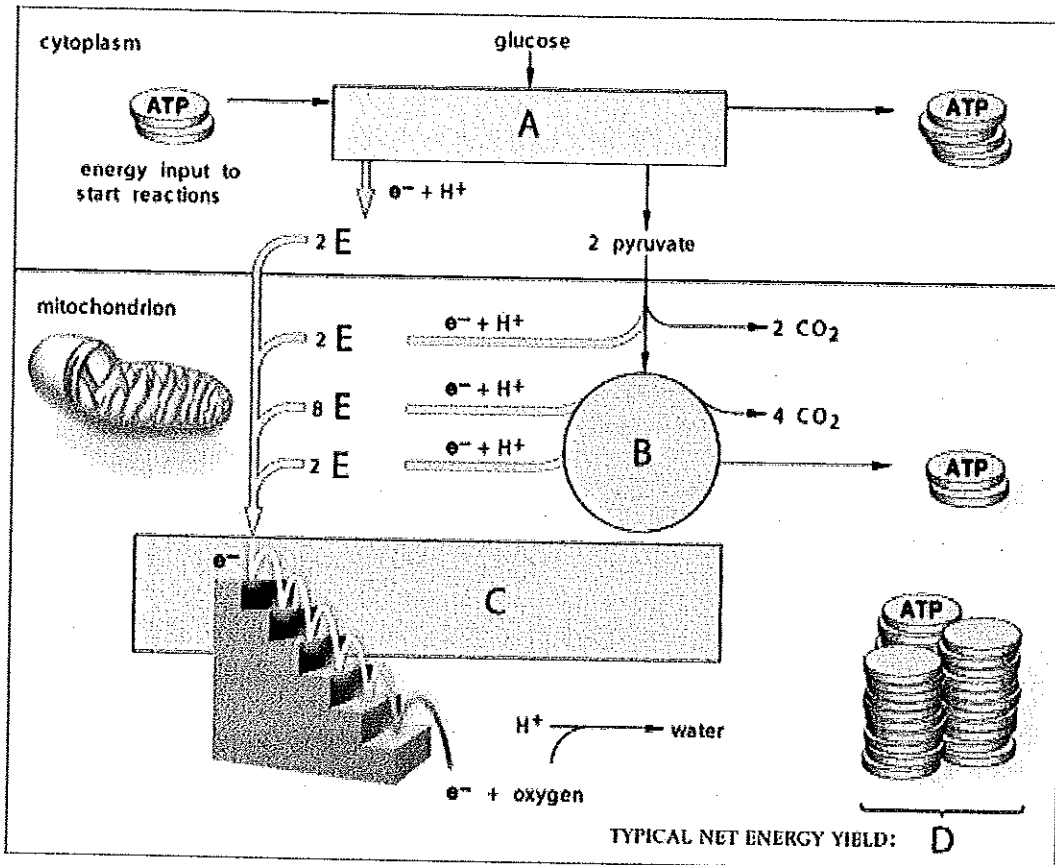
61. This compound is utilized in alcoholic fermentation and lactate fermentation.

62. This compound is the most likely end-product of a human runner experiencing an oxygen debt.

63. This compound is an intermediate product of alcoholic fermentation, but not lactate fermentation.

64. This compound is the end product of glycolysis.

65. This compound is an end-product of anaerobic respiration in exercising muscle.



Use the diagram above for the next five items.

66. All of the lines labeled "E" represent

- a. $FADH_2$.
- b. NADH.
- c. NADPH.
- d. either $FADH_2$ or NADH.
- e. none of these choices

67. The glycolysis reactions are represented by the letter _____.

68. Electron transfer phosphorylation is represented by the letter _____.

69. The net ATP yield (at letter "D") from the metabolism of one glucose molecule is

- a. 32.
- b. 4.
- c. 36.
- d. 64.
- e. 28.

70. The Krebs cycle is represented by the letter _____.

1. Which of the following are products of cellular respiration?

- a. glucose and carbon dioxide
- b. oxygen and carbon dioxide
- c. oxygen and glucose
- d. energy to make ATP and carbon dioxide
- e. oxygen and energy to make ATP

2. Which of the following statements is/are true about the energy yields from cellular respiration?

- a. Cellular respiration converts all of the energy in glucose into high-energy ATP bonds.
- b. Cellular respiration converts the kinetic energy of glucose into chemical energy.
- c. The heat produced during cellular respiration is only a tiny fraction of the chemical energy available in a glucose molecule.
- d. Cellular respiration is more efficient at harnessing energy from glucose than car engines are at harnessing energy from gasoline.
- e. All of the choices are true.

3. The overall equation for the cellular respiration of glucose is

- a. $C_6H_{12}O_{12} + 3 O_2 \rightarrow 6 CO_2 + 6 H_2O + \text{energy}$.
- b. $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 CO_2 + 6 H_2O + \text{energy}$.
- c. $5 CO_2 + 6 H_2O \rightarrow C_5H_{12}O_6 + 6 O_2 + \text{energy}$.
- d. $C_6H_{12}O_6 + 6 O_2 \rightarrow 5 CO_2 + 6 H_2O + \text{energy}$.
- e. None of the choices are correct.

4. Humans use about _____ of their daily calories for involuntary life-sustaining activities such as digestion, circulation, and breathing.

- a. 75%
- b. 50%
- c. 25%
- d. 10%
- e. 90%

5. During cellular respiration, the energy in glucose

- a. is carried by electrons.
- b. becomes stored in molecules of ammonia.
- c. is used to manufacture glucose.
- d. is released all at once.
- e. None of the choices are correct.

6. During redox reactions

- a. protons from one molecule replace the electrons lost from another molecule.
- b. a substance that gains electrons is said to be oxidized.
- c. electrons are lost from one substance and added to another substance.
- d. the loss of electrons from one substance is called reduction.
- e. None of the choices are correct.

7. During cellular respiration, electrons move through a series of electron-carrier molecules. Which of the following is a true statement about this process?

- a. The electrons release large amounts of energy each time they are transferred from one carrier to another.
- b. The carrier molecules are found in the cytoplasm of eukaryotic and prokaryotic cells.
- c. Molecular oxygen is eventually oxidized by the electrons to form water.
- d. The electrons move from carriers that have more affinity for them to carriers that have less affinity for them.
- e. None of the statements are true.

8. **The functioning of an electron transport chain is analogous to**
- a person climbing a flight of stairs one step at a time.
 - a canoe going over a waterfall.
 - playing Ping-Pong.
 - a person leaping from the top to the bottom of a flight of stairs in one jump.
 - a Slinky toy going down a flight of stairs.
9. **Which one of the following is the correct sequence of stages in cellular respiration?**
- oxidative phosphorylation, glycolysis, and the citric acid cycle
 - oxidative phosphorylation, the citric acid cycle, and glycolysis
 - glycolysis, oxidative phosphorylation, and the citric acid cycle
 - the citric acid cycle, oxidative phosphorylation, and glycolysis
 - glycolysis, the citric acid cycle, and oxidative phosphorylation
10. **A drug is tested in the laboratory and is found to create holes in both mitochondrial membranes. Scientists suspect that the drug will be harmful to human cells because it will inhibit**
- oxidative phosphorylation.
 - glycolysis.
 - the citric acid cycle.
 - the formation of alcohol.
 - the citric acid cycle and oxidative phosphorylation.
11. **Glycolysis is considered to be an ancient metabolic system because**
- it occurs universally.
 - is not located in a membrane-bound organelle.
 - it does not require oxygen.
 - More than one of the choices are correct.
 - None of the choices are correct.
12. **Which of the following is a result of glycolysis?**
- conversion of glucose to two three-carbon compounds
 - conversion of NADH to NAD to power of ((+))
 - production of CO with subscript((2))
 - conversion of FAD to FADH with subscript((2))
 - a net loss of two ATPs per glucose molecule
13. **The end products of glycolysis include**
- FADH.
 - citric acid.
 - acetyl CoA.
 - O₂.
 - NADH.
14. **Pyruvic acid is considered a(n) _____ aerobic cellular respiration. 30) _____**
- intermediate in
 - cofactor in
 - end product of
 - source of O with subscript((2)) for
 - enzyme in
15. **Between glycolysis and the citric acid cycle,**
- a carbon atom is added to make a four-carbon compound.
 - coenzyme A is cleaved off of the four-carbon compound.
 - pyruvate is oxidized while a molecule of NAD⁺ is reduced to NADH.
 - More than one of the choices is correct.
 - None of the choices are correct.
16. **The end products of the citric acid cycle include all of the following except**
- NADH.
 - CO with subscript((2)).
 - ATP.
 - FADH with subscript((2)).
 - pyruvic acid.

17. At the end of the citric acid cycle, most of the energy remaining from the original glucose is stored in
- NADH.
 - FADH with subscript(2).
 - pyruvic acid.
 - CO with subscript(2).
 - ATP.
18. A mutant protist is found in which some mitochondria lack an inner mitochondrial membrane. Which of the following pathways would be completely disrupted in these mitochondria?
- alcoholic fermentation
 - the citric acid cycle and glycolysis
 - glycolysis
 - the citric acid cycle
 - oxidative phosphorylation
19. In the electron transport chain, the final electron acceptor is
- ADP.
 - an oxygen atom.
 - ATP.
 - a molecule of carbon dioxide.
 - a molecule of water.
20. Which of the following statements about the inner mitochondrial membrane is false?
- It plays a role in the production of pyruvic acid.
 - It is involved in chemiosmosis.
 - ATP synthase is associated with it.
 - A gradient of H to power of ((+)) exists across it.
 - Electron carriers are associated with it.
21. The mitochondrial cristae are an adaptation that
- permits the expansion of mitochondria as oxygen accumulates in the mitochondrial matrix.
 - increases the space for more copies of the electron transport chain and ATP synthase complexes.
 - carefully encloses the DNA housed within the mitochondrial matrix.
 - helps mitochondria divide during times of greatest cellular respiration.
 - None of the choices are correct.
22. When an organism such as a yeast lives by fermentation, it converts the pyruvic acid from glycolysis into a different compound, such as alcohol. Why doesn't it secrete the pyruvic acid directly?
- The conversion yields one FADH with subscript(2) per pyruvic acid molecule.
 - The conversion is needed to regenerate the NAD to power of ((+)) consumed during glycolysis.
 - A buildup of pyruvic acid in the surrounding environment would be too toxic.
 - The conversion yields one NADH per pyruvic acid molecule.
 - The conversion yields one ATP per pyruvic acid molecule.
23. Which of the following processes produces the most ATP per molecule of glucose oxidized?
- aerobic respiration
 - lactic acid fermentation
 - anaerobic respiration
 - alcoholic fermentation
 - All produce approximately the same amount of ATP per molecule of glucose.
24. Bacteria that are unable to survive in the presence of oxygen are called
- strict anaerobes.
 - aerobes.
 - chemosynthetic bacteria.
 - microaerophiles.
 - facultative anaerobes.
25. Muscle soreness associated with strenuous exercise is at least partly due to
- an excess of ATP that builds up during vigorous exercise.
 - the accumulation of alcohol from anaerobic respiration.
 - the presence of lactic acid produced during fermentation in muscle cells.
 - the large amount of carbon dioxide that builds up in the muscle.
 - None of the choices are correct.

26. In yeast cells,
- glucose is produced during photosynthesis.
 - lactic acid is produced during glycolysis.
 - alcohol is produced after glycolysis.
 - lactic acid is produced during anaerobic respiration.
 - alcohol is produced during the citric acid cycle.
27. To obtain energy from starch and glycogen, the body must begin by
- converting both starch and glycogen to fatty acids.
 - hydrolyzing the starch to glucose and the glycogen to amino acids.
 - hydrolyzing both starch and glycogen to glucose.
 - removing nitrogen atoms from both molecules.
 - None of the choices are correct.
28. When proteins are used as a source of energy for the body, the proteins 59) _____
- are hydrolyzed to glycerols and then converted to glyceraldehyde 3-phosphate, which is fed into glycolysis.
 - are converted into glucose molecules, which are fed into glycolysis.
 - are hydrolyzed to fatty acids and converted to acetyl CoA, which enters the citric acid cycle.
 - are converted mainly into intermediates of glycolysis or the citric acid cycle.
 - are hydrolyzed to their constituent amino acids; electrons are stripped from the amino acids and passed to the electron transport chain.
29. When a fatty acid is used for aerobic respiration, it first hydrolyzes fats to
- sugars and amino acids.
 - glycerol and fatty acids.
 - sugars and glycerol.
 - glycerol and amino acids.
 - fatty acids and sugars.
30. Which one of the following statements is false? Food provides the raw materials for biosynthetic pathways. These pathways
- can produce molecules that are not actually present in the original food.
 - can produce sugar by a process that is the exact opposite of glycolysis.
 - consume ATP.
 - make molecules for cellular repair and growth.
 - can use "intermediate" compounds from glycolysis and the citric acid cycle to make food.
31. Which of the following organisms can make organic molecules from water and carbon dioxide?
- bear
 - mushroom
 - crayfish
 - wheat
 - All of the choices can make organic molecules from water and carbon dioxide.

KEY

1. **ATP**
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 - b. is produced in the degradation of organic compounds such as glucose.
 - c. is generated in anaerobic respiration.
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 - b. hydrogen
 - c. oxygen
 - d. phosphorus
 - e. sodium
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 - b. photophosphorylation.
 - c. glycolysis and fermentation.
 - d. the Krebs cycle.
 - e. aerobic respiration.
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- c. breaks down glucose in reaction with oxygen.
- d. is restricted to yeasts.
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19. If you were searching for anaerobic bacteria, you would NOT look for them in

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- b. is due to oxygen deficiency.
- c. is an NAD regenerator.
- d. is temporary and is due to oxygen deficiency.
- e. is temporary, is due to oxygen deficiency, and regenerates NAD.

21. Lactic acid fermentation is seen in

- a. fast twitch muscle fibers.
- b. slow twitch muscle fibers.
- c. intermediate twitch muscle fibers.
- d. both fast and intermediate fibers.
- e. all three fiber types.

22. When blood glucose levels decrease (as between meals), what reserves are tapped?

- a. glycogen -- 1st
- b. fats -- 2nd
- c. proteins -- 3rd
- d. steroids
- e. amino acids

23. Glucose is converted into glycogen in the

- a. brain.
- b. muscles.
- c. liver.
- d. brain and liver.
- e. muscles and liver.

24. Glucagon prompts what organ(s) to convert glycogen to glucose?

- a. brain
- b. liver
- c. muscles
- d. brain and muscles
- e. brain and liver

25. Glycogen makes up what percentage of a human's energy reserves?

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26. When proteins and fats are used as energy sources, their breakdown subunits enter

- a. glycolysis.
- b. electron transport.
- c. the Krebs cycle.
- d. chemiosmosis.
- e. fermentation.

27. Which of the following is not a hydrogen acceptor?

- a. oxygen
- b. cytochrome
- c. ATP
- d. NAD^+
- e. FAD

28. Which compounds is not associated with anaerobic pathways?

- a. pyruvate
- b. lactic acid
- c. ethanol
- d. oxaloacetic acid
- e. phosphoglyceraldehyde (PGAL)

29. Which compound is not part of the glycolysis reactions?

- a. fructose-1,6-bisphosphate
- b. 3-phosphoglycerate (3-PGA)
- c. pyruvate
- d. phosphoenol pyruvate (PEP)
- e. isocitrate

30. Which process below is not part of the degradation processes for carbon compounds?

- a. Calvin-Benson cycle
- b. Krebs cycle
- c. fermentation
- d. respiration
- e. glycolysis

Choose the one most appropriate answer for each.

- a. produces NADH and CO_2 ; changes pyruvate
- b. produces ATP, NADH , and CO_2
- c. splits glucose into two pyruvate molecules
- d. regenerates NAD^+ as pyruvate is converted to ethanol or lactate.
- e. uses a membrane-bound system that contains cytochromes to produce ATP

51. glycolysis

52. fermentation

53. acetyl-CoA formation

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55. electron transfer phosphorylation

Use the five processes listed below to answer questions.

- a. glycolysis
- b. aerobic respiration
- c. anaerobic electron transport
- d. alcoholic fermentation
- e. lactate fermentation

56. This process yields two molecules of ATP and the final product ethanol.

57. This process yields a final product called lactate.

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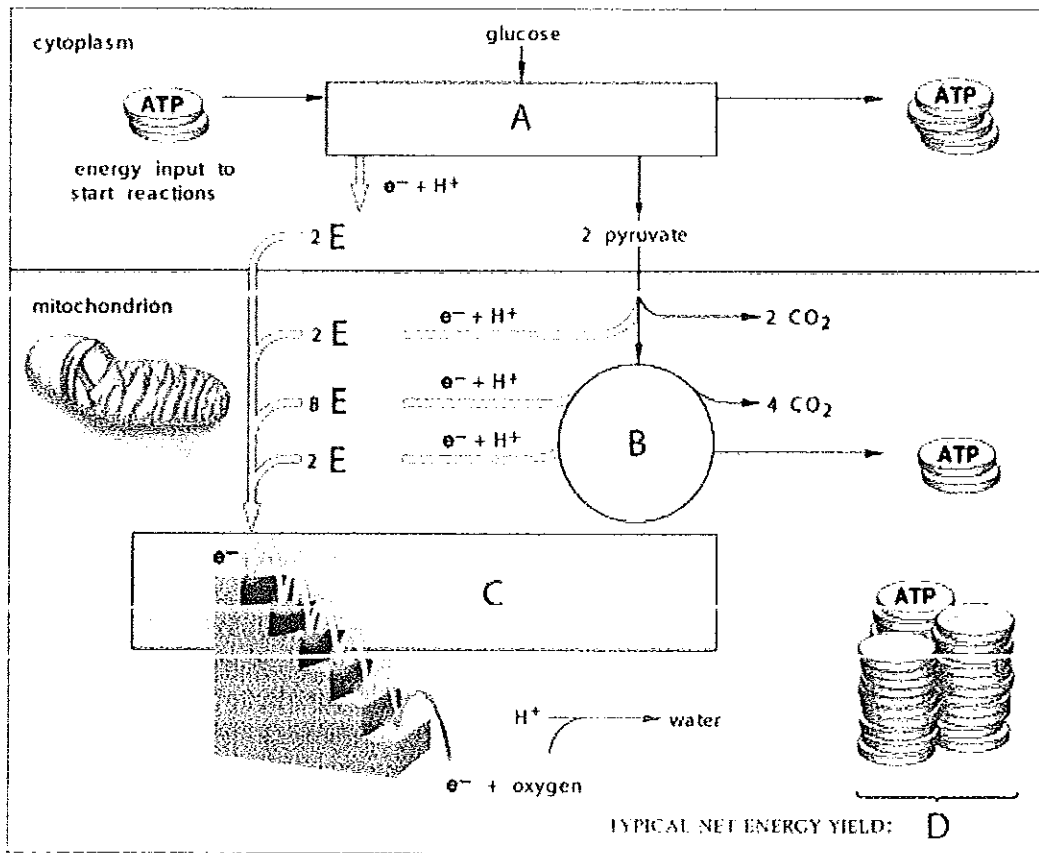
59. This process involves electron transfer phosphorylation.

60. This process precedes the Krebs cycle.

Use the five compounds listed below to answer questions.

- ethanol
- pyruvate
- lactate
- citrate
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- B 61. This compound is utilized in alcoholic fermentation and lactate fermentation.
 C 62. This compound is the most likely end-product of a human runner experiencing an oxygen debt.
 E 63. This compound is an intermediate product of alcoholic fermentation, but not lactate fermentation.
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Use the diagram above for the next five items.

66. All of the lines labeled "E" represent
- $FADH_2$.
 - NADH.
 - NADPH.
 - either $FADH_2$ or NADH.
 - none of these choices

67. The glycolysis reactions are represented by the letter A.
68. Electron transfer phosphorylation is represented by the letter C.

69. The net ATP yield (at letter "D") from the metabolism of one glucose molecule is

- a. 32.
- b. 4.
- c. 36.-38
- d. 64.
- e. 28.

70. The Krebs cycle is represented by the letter B.

1. Which of the following are products of cellular respiration?

- a. glucose and carbon dioxide
- b. oxygen and carbon dioxide
- c. oxygen and glucose
- d. energy to make ATP and carbon dioxide
- e. oxygen and energy to make ATP

2. Which of the following statements is/are true about the energy yields from cellular respiration?

- a. Cellular respiration converts all of the energy in glucose into high-energy ATP bonds.
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- a. $C_6H_{12}O_{12} + 3 O_2 \rightarrow 6 CO_2 + 6 H_2O + \text{energy}$.
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- a. The electrons release large amounts of energy each time they are transferred from one carrier to another.
- b. The carrier molecules are found in the cytoplasm of eukaryotic and prokaryotic cells.
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 - a canoe going over a waterfall.
 - playing Ping-Pong.
 - a person leaping from the top to the bottom of a flight of stairs in one jump.
 - a Slinky toy going down a flight of stairs.
9. Which one of the following is the correct sequence of stages in cellular respiration?
- oxidative phosphorylation, glycolysis, and the citric acid cycle
 - oxidative phosphorylation, the citric acid cycle, and glycolysis
 - glycolysis, oxidative phosphorylation, and the citric acid cycle
 - the citric acid cycle, oxidative phosphorylation, and glycolysis
 - glycolysis, the citric acid cycle, and oxidative phosphorylation
10. A drug is tested in the laboratory and is found to create holes in both mitochondrial membranes. Scientists suspect that the drug will be harmful to human cells because it will inhibit
- oxidative phosphorylation.
 - glycolysis.
 - the citric acid cycle.
 - the formation of alcohol.
 - the citric acid cycle and oxidative phosphorylation.
11. Glycolysis is considered to be an ancient metabolic system because
- it occurs universally.
 - is not located in a membrane-bound organelle.
 - it does not require oxygen.
 - More than one of the choices are correct.
 - None of the choices are correct.
- All three*
12. Which of the following is a result of glycolysis?
- conversion of glucose to two three-carbon compounds
 - conversion of NADH to NAD to power of ((+))
 - production of CO with subscript((2))
 - conversion of FAD to FADH with subscript((2))
 - a net loss of two ATPs per glucose molecule
13. The end products of glycolysis include
- FADH.
 - citric acid.
 - acetyl CoA.
 - O₂.
 - NADH.
14. Pyruvic acid is considered a(n) _____ aerobic cellular respiration. 30) _____
- intermediate in
 - cofactor in
 - end product of
 - source of O with subscript((2)) for
 - enzyme in
15. Between glycolysis and the citric acid cycle,
- a carbon atom is added to make a four-carbon compound.
 - coenzyme A is cleaved off of the four-carbon compound.
 - pyruvate is oxidized while a molecule of NAD⁺ is reduced to NADH.
 - More than one of the choices is correct.
 - None of the choices are correct.
16. The end products of the citric acid cycle include all of the following except
- NADH.
 - CO with subscript((2)).
 - ATP.
 - FADH with subscript((2)).
 - pyruvic acid.

17. At the end of the citric acid cycle, most of the energy remaining from the original glucose is stored in
- NADH.
 - FADH with subscript((2)).
 - pyruvic acid.
 - CO with subscript((2)).
 - ATP.
18. A mutant protist is found in which some mitochondria lack an inner mitochondrial membrane. Which of the following pathways would be completely disrupted in these mitochondria?
- alcoholic fermentation
 - the citric acid cycle and glycolysis
 - glycolysis
 - the citric acid cycle
 - oxidative phosphorylation
19. In the electron transport chain, the final electron acceptor is
- ADP.
 - an oxygen atom.
 - ATP.
 - a molecule of carbon dioxide.
 - a molecule of water.
20. Which of the following statements about the inner mitochondrial membrane is false?
- It plays a role in the production of pyruvic acid.
 - It is involved in chemiosmosis.
 - ATP synthase is associated with it.
 - A gradient of H⁺ to power of ((+)) exists across it.
 - Electron carriers are associated with it.
21. The mitochondrial cristae are an adaptation that
- permits the expansion of mitochondria as oxygen accumulates in the mitochondrial matrix.
 - increases the space for more copies of the electron transport chain and ATP synthase complexes.
 - carefully encloses the DNA housed within the mitochondrial matrix.
 - helps mitochondria divide during times of greatest cellular respiration.
 - None of the choices are correct.
22. When an organism such as a yeast lives by fermentation, it converts the pyruvic acid from glycolysis into a different compound, such as alcohol. Why doesn't it secrete the pyruvic acid directly?
- The conversion yields one FADH with subscript((2)) per pyruvic acid molecule.
 - The conversion is needed to regenerate the NAD⁺ to power of ((+)) consumed during glycolysis.
 - A buildup of pyruvic acid in the surrounding environment would be too toxic.
 - The conversion yields one NADH per pyruvic acid molecule.
 - The conversion yields one ATP per pyruvic acid molecule.
23. Which of the following processes produces the most ATP per molecule of glucose oxidized?
- aerobic respiration
 - lactic acid fermentation
 - anaerobic respiration
 - alcoholic fermentation
 - All produce approximately the same amount of ATP per molecule of glucose.
24. Bacteria that are unable to survive in the presence of oxygen are called
- strict anaerobes.
 - aerobes.
 - chemosynthetic bacteria.
 - microaerophiles.
 - facultative anaerobes.
25. Muscle soreness associated with strenuous exercise is at least partly due to
- an excess of ATP that builds up during vigorous exercise.
 - the accumulation of alcohol from anaerobic respiration.
 - the presence of lactic acid produced during fermentation in muscle cells.
 - the large amount of carbon dioxide that builds up in the muscle.
 - None of the choices are correct.