

How Cells Harvest Energy - Chapter 9

Multiple Choice Quiz

Term Review

Please answer all questions *online if you choose*

*<http://highered.mcgraw-hill.com/sites/0073031208/>*

**1** When energy-depleted elements associated with a proton are accepted by an organic molecule, the process is called

- A) fermentation
- B) anaerobic
- C) aerobic
- D) catabolism

*Omit*

*Choose:  
Student center  
click chapter  
click multiple  
choice*

**2** An example of anaerobic would be

- A) production of sulfates from H<sub>2</sub>S
- B) production of methane by methanogens
- C) glycolysis by purple bacteria
- D) utilization of methane by methanogens

**3** The end product of glycolysis is

- A) NADH
- B) acetyl-CoA
- C) lactate
- D) pyruvate

**4** The final output of the Krebs cycle includes all of the following except

- A) NADP
- B) FADH<sub>2</sub>
- C) ATP
- D) CO<sub>2</sub>

*Omit; no  
correct answer*

**5** The usefulness of fermentation as a means of deriving energy is limited because

- A) it cannot generate enough ATP
- B) it produces too much NH<sub>2</sub>
- C) the end products are toxic to the producer
- D) it uses more energy than it produces

**6** Which of the following is not a product of fermentation?

- A) CO<sub>2</sub>
- B) O<sub>2</sub>
- C) ethanol
- D) lactate
- E) all of the above are products of fermentation

**7** What substance is produced by the oxidation of pyruvate and feeds into the citric acid cycle?

- A) pyruvate
- B) glucose
- C) acetyl-CoA
- D) O<sub>2</sub>
- E) CO<sub>2</sub>

**9** Hans Krebs discovered (worked out the details of)

- A) glycolysis
- B) fermentation
- C) the oxidation of pyruvate
- D) the citric acid cycle
- E) electron transport and chemiosmosis

**10** Oxidative respiration in eukaryotes has an efficiency level of approximately

- A) 2%
- B) 63%
- C) 14%
- D) 36%
- E) 32%

*In, only for interest sake. Not testable.*

**11** In aerobic cellular respiration, which generates more ATP, substrate-level phosphorylation or chemiosmosis?

- A) substrate-level phosphorylation
- B) chemiosmosis
- C) both generate the same amount of ATP
- D) neither generates any ATP

**12** What role does  $O_2$  play in aerobic respiration?

- A) it plays no role
- B) it combines with acetyl-CoA at the start of the Krebs cycle
- C) it is given off as a by-product during the oxidation of pyruvate
- D) it combines with  $H_2O$  to help drive the formation of ATP
- E) it is the final electron acceptor at the end of the electron transport chain

**13** During aerobic respiration,  $FADH_2$  is produced in

- A) glycolysis
- B) the oxidation of pyruvate
- C) the Krebs cycle
- D) the electron transport chain
- E) fermentation

**14** NADH is produced during

- A) glycolysis
- B) the oxidation of pyruvate
- C) the Krebs cycle
- D) all of the above
- E) none of the above

**15** Organisms that do not have the ability to produce or synthesize their own food are called

- A) anaerobic
- B) autotrophs
- C) exergonic
- D) catabolic
- E) heterotrophs

*Next term question. Not testable.*

**17** During what stage of cellular respiration is the most ATP synthesized?

- A) glycolysis
- B) oxidation of pyruvate
- C) Krebs cycle
- D) fermentation
- E) chemiosmosis

**18** Catabolic processes

- A) make complex molecules from simpler ones
- B) break complex molecules into simpler ones
- C) occur only in autotrophs
- D) occur only in heterotrophs
- E) none of the above

**21** During chemiosmosis in aerobic respiration, protons are pumped

- A) out of the cell
- B) out of the mitochondria into the cell cytoplasm
- C) out of the mitochondrial matrix into the outer compartment of the mitochondria
- D) out of the cell cytoplasm into the matrix of the mitochondria
- E) out of the nucleus and into the mitochondria

**22** Each molecule of  $\text{FADH}_2$  results in the production of how many ATP molecules during aerobic respiration?

- A) 2
- B) 3
- C) 4
- D) 18
- E) 36

**23** Which of the following organisms carries out cellular respiration?

- A) a corn plant
- B) a dog
- C) a yeast
- D) a bacterium
- E) all of the above

**25** The oxidation of glucose to two molecules each of pyruvate, ATP, and NADH is called \_\_\_\_\_ and occurs in the \_\_\_\_\_.

- A) glycolysis; cytoplasm
- B) fermentation; cytoplasm
- C) the Krebs cycle; matrix of the mitochondrion
- D) anaerobic respiration; cytoplasm
- E) the respiratory electron transport chain; cristae of the mitochondrion

**26** A cell culture was supplied with radioactively labeled  $\text{O}_2$ . The cells were monitored. In a few minutes the radioactive oxygen atoms were present in which of the following compounds:

- A) carbon dioxide
- B) NADH and  $\text{FADH}_2$
- C) water
- D) ATP
- E) lactic acid

- 27** During respiration, NADH donates two electrons to the carrier known as ubiquinone. When this happens, ubiquinone:
- A) becomes oxidized.
  - B) passes the electrons directly to  $O_2$  which is reduced to water.
  - C) pumps protons across the inner mitochondrial membrane.
  - D) all of the above.

- 30** Pyruvate is oxidized when oxygen is present.
- A) True
  - B) False

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## *Offline Review*

- 31.** In comparison with aerobic respiration, anaerobic respiration:
- a. requires oxygen and releases more energy
  - b. requires oxygen and releases less energy
  - c. does not require oxygen and releases more energy
  - d. does not require oxygen and releases less energy
- 32.** Most of the energy yield in respiration results from:
- a. electron transport system
  - b. conversion of glucose to lactate
  - c. conversion of glucose to pyruvate
  - d. Krebs's cycle
- 33.** Complete cellular respiration of a glucose molecule will include:
- a. Krebs cycle and the ETS only
  - b. Glycolysis, Krebs cycle and the ETS
  - c. Krebs cycle only
  - d. ETS only
- 34.** How many molecules of ATP will be produced from the complete oxidation of one glucose molecule?
- a. 1
  - b. 2
  - c. 24
  - d. 36

35. Before glucose can be used in cellular respiration, the glucose molecule must be converted into

- a. alcohol      b. water      c. pyruvate      d. CO<sub>2</sub>

36. Most enzymes responsible for aerobic respiration are found in:

- a. lysosomes      b. mitochondria  
c. vacuoles      d. ribosomes

37. The process in respiration that begins by splitting a 6-C glucose molecule into two 3-C pyruvate molecules is called:

- a. glycolysis      b. Krebs cycle  
c. ETS      d. fermentation

38. The oxygen inhaled during respiration appears in the product(s) as:

- a. the carbon dioxide      b. the water  
c. the water and the carbon dioxide      d. alcohol

39. The process of glycolysis occurs in the:

- a. mitochondria      b. cytoplasm  
c. ribosomes      d. nucleus

40. One would expect the rate of <sup>cellular</sup> respiration to be greatest among:

- a. lungs tissue      b. skin tissue  
c. muscle tissue      d. bone tissue

41. Each of the steps of anaerobic glycolysis:

- a. is speeded up by a specific enzyme  
b. occurs in the mitochondria  
c. can occur only in the presence of oxygen  
d. is coupled to the synthesis of one molecule of ATP

Use the following information to answer the next question.

Equal volumes of live animal cells were placed in four test tubes labelled W, X, Y, and Z. In addition to the cells, each test tube contained water, glucose, and oxygen, in the quantities shown below.

Test Tube	Water (L)	Glucose (g)	Oxygen (L)	Temperature (°C)
W	1	3	0.00	37
X	1	3	0.03	37
Y	1	3	0.01	37
Z	1	3	0.05	37

42. Based on the data provided, the cells in which test tube will produce the greatest amount of ATP?

- a. W                      b. X                      c. Y                      d. Z

43.  $\text{NAD}^+$  and  $\text{FAD}^{2+}$  act as:

- a. vitamins                      b. enzyme stimulants  
c. ETS enzymes                      d.  $\text{H}^+$  acceptors

44. Which of the following chemical substances enters the Krebs cycle and reacts with the 4-C ~~pyruvate~~ molecule?

- oxaloacetic*  
a. pyruvate                      b. acetyl CoA                      c. glucose                      d. lactic acid

45. Cellular respiration includes all of the following steps except one. Choose the exception.

- a. Two molecules of pyruvate are produced from one glucose molecule.  
b. 36 ATP molecules are produced in total.  
c. Pyruvate is oxidized to produce carbon dioxide and water.  
d. High energy electrons are accepted by a series of proteins in the ETS.

46. **Ana**erobic respiration is an orderly sequence of reactions. Which is the proper order of the following products during this process?

- a. PGAL → pyruvate → glucose
- b. Glucose → PGAL → pyruvate
- c. Pyruvate → PGAL → glucose
- d. Glucose → pyruvate → PGAL

*PGAL is same  
as G3P.*

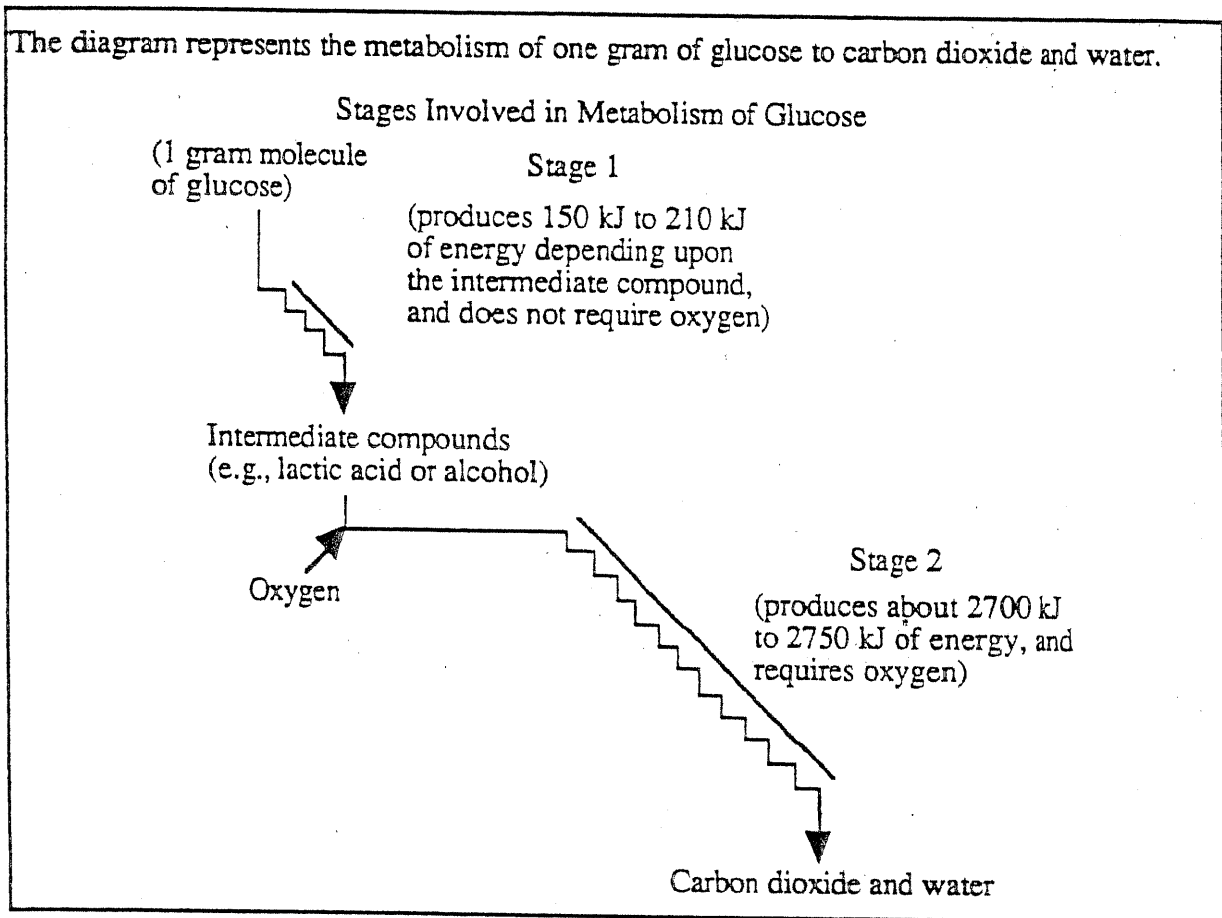
47. The reaction  $\text{NAD}^+ \rightarrow \text{NADH}$  occurs when  $\text{NAD}^+$ :

- a. loses electrons
- b. loses hydrogen ions
- c. accepts hydrogen ions
- d. is oxidized

48. The final electron acceptor in the aerobic ETS is:

- a.  $\text{FADH}_2$
- b. NADH
- c. oxygen
- d. proteins

Use the following information to answer the next question.



49. Analyze the diagram and determine the INCORRECT statement relating to it.
- Stage 1 produces an intermediate compound that would build up in the muscles of an athlete suffering from oxygen debt, while stage 2 does not.
  - Stage 2 occurs in the mitochondrion; Stage 1 occurs in the cytoplasm.
  - Stage 2 uses the Krebs cycle; while Stage 1 does not.
  - Stage 1 uses hydrogen acceptors; while Stage 2 does not use hydrogen acceptors.

50. A chemical substance that loses an electron or hydrogen atom, is said to be:

- oxidized
- reduced
- energized
- excited



# Term Review: Cellular Respiration

1. omit (D)
2. C
3. D
4. omit
5. C
6. B
7. C
9. D
10. E
11. B
12. E
13. C
14. D
15. E
17. E
18. B
21. C
22. A (NADP=3ATP)
23. E
25. A
26. C
27. C
30. A
31. D
32. A
33. B
34. D
35. C
36. B
37. A
38. B
39. B
40. C
41. A
42. D
43. D
44. B
45. C
46. B
47. C
48. C
49. D
50. A