

Review questions for Cellular Respiration lecture

Multiple choice review questions:

- 1) Which molecule **is** required for cellular aerobic respiration but **is not** required for cellular anaerobic respiration?
 - A) glucose
 - B) fatty acid
 - C) oxygen
 - D) amino acid

- 2) Which of these is *not* a final product of aerobic cell respiration?
 - A) carbon dioxide
 - B) water
 - C) oxygen
 - D) energy (ATP)

- 3) Which of the following statements about *glycolysis* is *false*?
 - A) It results in the formation of two molecules of pyruvate
 - B) It produces four ATP molecules.
 - C) It can occur with or without oxygen present.
 - D) it takes place in the cytoplasm, not in the mitochondria.

- 4) As a result of *anaerobic respiration* in humans, glucose is converted to
 - A) pyruvic acid.
 - B) lactic acid.
 - C) citric acid.
 - D) acetyl CoA.

- 5) The organ that stores glucose as glycogen and that produces ketone bodies.
 - A) liver.
 - B) brain.
 - C) cardiac muscle.
 - D) skeletal muscle.

- 6) In addition to energy (ATP), what is (are) the final product(s) of aerobic respiration?
 - A) O₂ and CO₂
 - B) CO₂ and H₂O
 - C) O₂ and H₂O
 - D) CO₂ only

- 7) The term _____ means when the body makes glucose molecules from non-carbohydrate molecules (such as fats and amino acids).
- A) Anaerobic respiration
 - B) Glycogenolysis
 - C) Gluconeogenesis
 - D) Glycolysis
- 8) Which of the following is **not** a fuel molecule for aerobic respiration?
- A) nucleotides
 - B) glucose
 - C) amino acids
 - D) fats
- 9) Anaerobic respiration of glucose produces _____ as a product.
- A) carbon dioxide
 - B) lactic acid
 - C) glycogen
 - D) fatty acid
- 10) For every glucose molecule that is broken down by glycolysis, two molecules of _____ are made.
- A) CO₂
 - B) pyruvate
 - C) lactate
 - D) acetyl CoA
- 11) Which of the following statements is true about the electron transport system?
- A) It is in the mitochondria
 - B) It occurs after the citric acid cycle
 - C) It produces ATP during aerobic and anaerobic respiration
 - D) It does not require oxygen
- 12) How many molecules of ATP are produced per molecule of glucose during anaerobic respiration?
- A) 36
 - B) 2
 - C) 34
 - D) 4
- 13) How many molecules of ATP are produced per molecule of glucose during aerobic respiration?
- A) 32
 - B) 4
 - C) 26
 - D) 20

Answers to multiple-choice questions:

- 1 = C
- 2 = C
- 3 = B
- 4 = B
- 5 = A
- 6 = B
- 7 = C
- 8 = A
- 9 = B
- 10 = B
- 11 = A
- 12 = B
- 13 = A

Fill-in-the-blank review questions:

- 1) When a protein in the cell uses an ATP for energy, the ATP becomes split apart into what two molecules?
- 2) The maximum number of ATP molecules produced by the aerobic respiration of one glucose molecule is _____.
- 3) Where do the CO₂ and H₂O molecules that are made by aerobic respiration in the cell go?
- 4) Name the three stages of aerobic respiration.
- 5) Most of the stages of aerobic respiration take place in the _____ organelle of the cell.
- 6) Although glucose is the usual “fuel” for cellular respiration, other molecules that the cell can use for fuel are _____, _____, and _____.
- 7) The purpose of cellular respiration is to recharge the cell’s _____ supply.
- 8) The breakdown of a single glucose molecule into two molecules of pyruvate is the first stage in cellular aerobic respiration. This stage is called _____.
- 9) Glycolysis is different in two ways from the other steps of cellular aerobic respiration: Glycolysis does/doesn’t (circle one) take place in the mitochondria. Glycolysis does/doesn’t (circle one) require oxygen.
- 10) The second stage of aerobic respiration is called _____.

- 11) The long chains of linked glucose molecules that are stored in liver and muscle cells are called _____ molecules.
- 12) The term _____ means when the long chains of linked glucose molecules (usually stored in liver and muscle cells) are broken down into individual glucose molecules.
- 13) The last stage of cellular aerobic respiration is called the _____.
- 14) The citric acid cycle and the electron transport system will stop producing ATP if there are no _____ molecules present.
- 15) The type of respiration that produces lactic acid from glucose when there isn't sufficient oxygen for aerobic respiration is known as _____.
- 16) The breakdown of one glucose molecule in the absence of oxygen leads to a gain of how many ATP molecules? _____
- 17) An example of a cell type that regularly uses anaerobic respiration are _____ cells.
- 18) Cellular anaerobic respiration is essentially the same as the _____ step of cellular aerobic respiration, except that the pyruvate molecules are converted into _____ molecules.
- 19) For each glucose that a cell uses for aerobic respiration, how many ATP molecules are produced from it if the cell is using aerobic respiration? _____. How many ATP molecules are produced from it if the cell is using anaerobic respiration? _____
- 20) What molecule causes the burning sensation in your muscles if you exercise vigorously?
- 21) The _____ organ produces ketone bodies from _____ molecules.
- 22) After each activity listed below, write Aerobic or Anaerobic to describe what kind of cellular respiration the muscle cells are using during that activity. In situations when both are occurring, write both answers.
- Reading: _____
- Standing: _____
- Sitting: _____
- Walking at a slow easy pace: _____
- Jumping up high in the air once or twice: _____
- Jogging at a comfortable pace: _____
- Sprinting as fast as you can for a short distance: _____

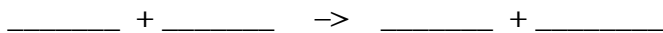
Answers to fill-in-the-blank review questions:

- 1) ADP and P_i (phosphate ion)
- 2) 32
- 3) Into the blood.
- 4) Glycolysis
 Krebs cycle
 Electron transport system
- 5) Mitochondria
- 6) Amino acids
 Fatty acids
 Ketone bodies
- 7) ATP
- 8) Glycolysis
- 9) Doesn't
 Doesn't
- 10) Citric acid cycle
- 11) Glycogen
- 12) Glycogenolysis

- 13) Electron transport system
- 14) O₂
- 15) Cellular anaerobic respiration
- 16) Two
- 17) Skeletal muscle cells
- 18) Glycolysis
 Lactic acid
- 19) 32
 2
- 20) Lactic acid
- 21) Liver
 Fatty acids
- 22) Aerobic
 Aerobic
 Aerobic
 Aerobic
 Anaerobic
 Aerobic and anaerobic
 Anaerobic

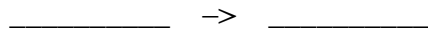
Short answer review questions:

1) Write the full chemical reaction for cellular aerobic respiration. Put the molecular formulas in the blanks. Under each blank, write the name of the molecule.



2) Make a table naming the three stages of cellular aerobic respiration. After each stage, list the number of ATPs that are made in that stage from each glucose that enters cellular aerobic respiration.

3) Write the full chemical reaction for cellular aerobic respiration. Put the molecular formulas in the blanks. Under each blank, write the name of the molecule.



4) What is the main advantage of anaerobic respiration to a cell (compared to aerobic respiration)? What is the main disadvantage?

5) A friend of yours in this class tells you the following: “Your cells are able to get energy using anaerobic respiration, which requires no oxygen. Therefore, you don’t need to breath to stay alive.” Explain to your friend why she is wrong.

Answers to short answer review questions:

- 1) $C_6H_{12}O_6$ + $6O_2$ \rightarrow $6H_2O$ + $6CO_2$
Glucose Oxygen Water Carbon dioxide
- 2) **Step:** 1) Glycolysis
2) Citric acid cycle cycle
3) Electron transport system
- ATP:** 2
30 (citric acid cycle and electron transport system together)
(see above)
- 3) $C_6H_{12}O_6$ \rightarrow $2C_3H_6O_3$
Glucose Lactic acid

4) The main advantage of cellular anaerobic respiration is that the cell can continue to make ATP even when there is insufficient oxygen for aerobic respiration. The main disadvantage is that the cell gains only 2 ATP per glucose (compared to 36 ATP per glucose using aerobic respiration), and therefore the cell depletes its glucose supply too quickly.

5) It is true that many cells can use anaerobic respiration to make ATP for a short time, but this process is so inefficient that the cells deplete their glucose supply very rapidly. Furthermore, not all cells in the body are capable of using anaerobic respiration.