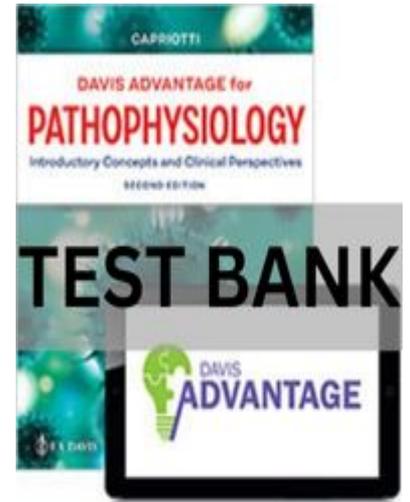


**Chapter 1, The Cell in Health and Illness**

**Multiple Choice**



Identify the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 1. Which statement regarding the sodium–potassium pump is correct?
  - 1. The cell’s plasma membrane is more soluble to sodium ions than potassium ions.
  - 2. The concentration of sodium ions should be higher inside the cell compartment.
  - 3. The concentration of potassium ions should be higher outside the cell compartment.
  - 4. The active transport involves pumping out three sodium ions and pumping in two potassium ions.
  
- \_\_\_\_\_ 2. In the absence of oxygen, which cellular function creates the same amount of energy as is created in the presence of oxygen?
  - 1. Dissipation of pyruvic acid
  - 2. Initiation of the citric acid cycle
  - 3. Activation of acetyl-coenzyme A
  - 4. Creation of acidosis via lactic acid
  
- \_\_\_\_\_ 3. How many adenosine triphosphates (ATPs) are produced in aerobic energy metabolism?
  - 1. 2
  - 2. 3
  - 3. 34
  - 4. 53
  
- \_\_\_\_\_ 4. Which cell organelles differ in their number according to the cell’s energy needs?
  - 1. Ribosomes
  - 2. Mitochondria
  - 3. Ribonucleic acids
  - 4. Deoxyribonucleic acids
  
- \_\_\_\_\_ 5. Which option best supports the reason more energy is produced when a person is exercising?
  - 1. Exercise causes an increase in the synthesis of protein.
  - 2. There is an increase in the production of pyruvic acid in the cells.
  - 3. The conversion of pyruvic acid to lactic acid is increased by exercise.
  - 4. Muscle cells have more mitochondria to meet energy demands.
  
- \_\_\_\_\_ 6. When does ribosomal protein synthesis cease?
  - 1. During endoplasmic reticulum stress
  - 2. During the synthesis of adenosine triphosphate (ATP)
  - 3. During a severe hypoxic state

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4. During the processing of prohormone
- \_\_\_\_\_ 7. Which cellular organelles are responsible for propelling mucus and inhaled debris out of the lungs?
1. Cilia
  2. Microfilaments
  3. Secretory vesicles
  4. Endoplasmic reticula
- \_\_\_\_\_ 8. Which are the key proteins in the contractile units of the muscle cells?
1. Actin and myosin
  2. Prohormone and tubulin
  3. Tubulin and actin
  4. Myosin and prohormone
- \_\_\_\_\_ 9. Which deficiency causes Tay–Sachs disease?
1. Proteasome
  2. Peroxisome
  3. Macrophage
  4. Lysosomal enzymes
- \_\_\_\_\_ 10. Which is a characteristic of adrenoleukodystrophy?
1. Accumulation of ganglioside
  2. Cessation of ribosomal protein synthesis
  3. Acceleration of cellular proteasome activity
  4. Accumulation of long-chain fatty acids in the nervous system
- \_\_\_\_\_ 11. Which statement regarding endoplasmic reticulum (ER) stress is correct?
1. During ER stress, proteins are rapidly degraded.
  2. During ER stress, lipids cannot travel to their proper intracellular locations.
  3. During ER stress, long-chain fatty acids accumulate in the nervous system.
  4. During ER stress, nondegraded substances accumulate in the cells.
- \_\_\_\_\_ 12. A client is diagnosed with type 1 diabetes mellitus. At a cellular level, which function is likely to be involved?
1. Inability of ribosomes to produce a specific type of protein
  2. Incorrect processing of a protein by the Golgi apparatus
  3. Stagnation of a previously dynamic action in microtubules
  4. Obstruction of the smooth endoplasmic reticulum
- \_\_\_\_\_ 13. A newborn patient exhibits characteristics of severe physical deformities. Which cellular component is examined to determine the cause and probability of the disease being genetically transferred?
1. Transfer RNA
  2. Ribosomal RNA
  3. Double helix of DNA
  4. Mitochondrial DNA
- \_\_\_\_\_ 14. A hiker experiences muscle pain and acidosis while ascending a mountain during a long, steep climb. Which is the reason for these manifestations?
1. Cellular hypoxia
  2. Autolysis
  3. Heterolysis

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4. Cellular edema
- \_\_\_\_\_ 15. Which factor provides DNA the unique molecular ability to replicate?
1. The pairing of nitrogenous bases
  2. The presence of pyrimidine bases
  3. The presence of nucleotides
  4. The nitrogenous base and phosphate bond
- \_\_\_\_\_ 16. How many nitrogenous bases compose a single codon?
1. 2
  2. 3
  3. 4
  4. 5
- \_\_\_\_\_ 17. Which components form the structure of DNA?
1. Nucleotides
  2. Amino acids
  3. Fatty acids
  4. Phosphates
- \_\_\_\_\_ 18. Which factor is essential in order for protein synthesis to occur?
1. Free-standing ribosomes within the cell
  2. Protein blueprint from the cell of the DNA
  3. Specific information from the nucleus of the cell
  4. Transfer RNA to move the protein out of the cell
- \_\_\_\_\_ 19. Tetracycline antibiotic is prescribed for an adult client with chlamydia infection. Which is the mechanism of action of the drug?
1. It prevents the replication of bacteria.
  2. It alters the configuration of bacterial cytoplasm.
  3. It interferes with the function of bacterial ribosomes.
  4. It inhibits the functions of bacterial mitochondria.
- \_\_\_\_\_ 20. Where does the conversion of a prohormone into a hormone take place?
1. In the ribosomes
  2. In the Golgi apparatus
  3. In the secretory granules
  4. In the endoplasmic reticulum
- \_\_\_\_\_ 21. Which is the cell's "master mind"?
1. Nucleus
  2. Ribosome
  3. Golgi apparatus
  4. Endoplasmic reticulum

**Multiple Response**

*Identify one or more choices that best complete the statement or answer the question.*

- \_\_\_\_\_ 22. Which statements regarding the microtubules are true? *Select all that apply.*
1. Microtubules are solid.
  2. Microtubules are flexible.
  3. Microtubules are composed of tubulin.

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4. Microtubules are called actin filaments.
  5. Microtubules have structures involved in cell division.
- \_\_\_\_\_ 23. Which cellular actions are carried out during the process of protein synthesis? *Select all that apply.*
1. DNA directs the cell to carry out the process.
  2. Transcription occurs in the ribosome of the cell.
  3. Protein translation takes place in the cell nucleus.
  4. RNA is single-stranded and travels outside the nucleus.
  5. In RNA, the pyrimidine base thymine is replaced with uracil.
- \_\_\_\_\_ 24. Which characteristics are specific to RNA during protein synthesis? *Select all that apply.*
1. Presence of ribose pentose sugar
  2. Presence of single-stranded helix
  3. Presence of double-stranded helix
  4. Presence of deoxyribose pentose sugar
  5. Presence of uracil and cytosine as a pyrimidine base
- \_\_\_\_\_ 25. Which are the purine bases found in DNA? *Select all that apply.*
1. Uracil
  2. Adenine
  3. Guanine
  4. Thymine
  5. Cytosine

**Chapter 1, The Cell in Health and Illness**  
**Answer Section**

**MULTIPLE CHOICE**

1. ANS: 4

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 1

Heading: Cell Structure and Function>The Sodium Potassium Pump (Na<sup>+</sup>/K<sup>+</sup> Pump)

Integrated Process: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Moderate

|   | Feedback                                                                                                              |
|---|-----------------------------------------------------------------------------------------------------------------------|
| 1 | This is incorrect. The plasma membrane of the cell is less soluble to sodium ions and more soluble to potassium ions. |
| 2 | This is incorrect. The concentration of sodium ions should be higher outside the cell compartment.                    |
| 3 | This is incorrect. The concentration of potassium ions should be higher inside the cell compartment.                  |
| 4 | This is correct. In active transport, for every three sodium ions pumped out, two potassium ions are pumped in.       |

PTS: 1

CON: Cellular Regulation

2. ANS: 2

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Discuss the difference between aerobic and anaerobic metabolism.

Page: 3

Heading: Cell Structure and Function>Energy Metabolism

Integrated Process: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Analysis [Analyzing]

Concept: Cellular Regulation

Difficulty: Difficult

|   | Feedback                                                                                                                                                                                                       |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | This is incorrect. When oxygen is not available, anaerobic metabolism produces significantly less cellular energy: a net yield of 2 ATP, as well as pyruvic acid.                                              |
| 2 | This is correct. In the absence of oxygen, pyruvic acid is converted into acetyl-coenzyme A, which triggers a series of reactions known as the <i>Krebs cycle</i> , also called the <i>citric acid cycle</i> . |
| 3 | This is incorrect. Pyruvic acid is converted into acetyl-coenzyme A, not activated.                                                                                                                            |

|          |                                                                                                                                                                                |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4</b> | This is incorrect. In cellular hypoxia, pyruvic acid is converted to lactic acid, which is noxious to cells, causing muscle pain and biochemical alterations such as acidosis. |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

PTS: 1                      CON: Cellular Regulation

3. ANS: 3

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Discuss the difference between aerobic and anaerobic metabolism.

Page: 3

Heading: Cell Structure and Function>Energy Metabolism

Integrated Process: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Knowledge [Remembering]

Concept: Cellular Regulation

Difficulty: Easy

|          | Feedback                                                                                                                                                    |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | This is incorrect. In anaerobic energy metabolism, 2 ATPs and pyruvic acid are produced.                                                                    |
| <b>2</b> | This is incorrect. In active transport, 3 sodium ions are pumped out. This takes place in the plasma membrane.                                              |
| <b>3</b> | This is correct. The process of aerobic energy requires oxygen and provides the maximum amount of energy for cellular function. The process yields 34 ATPs. |
| <b>4</b> | This is incorrect. Aerobic energy metabolism produces 34 ATPs, not 53.                                                                                      |

PTS: 1                      CON: Cellular Regulation

4. ANS: 2

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 3

Heading: Cell Structure and Function>Mitochondria

Integrated Process: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Moderate

|          | Feedback                                                                                                                                                                                                                                                       |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | This is incorrect. Ribosomes are small, spherical-shaped organelles of the ribosomal ribonucleic acid.                                                                                                                                                         |
| <b>2</b> | This is correct. Cell types differ in their number of mitochondria according to their energy needs. For example, muscle cells have abundant mitochondria because they require a high amount of energy to function, whereas bone cells have fewer mitochondria. |
| <b>3</b> | This is incorrect. Ribonucleic acid is not affected by the cell's energy needs.                                                                                                                                                                                |

|   |                                                                                                                                                                                        |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | This is incorrect. Deoxyribonucleic acid contains double-stranded helical chains containing various sequences of nucleotides. Its numbers are not affected by the cell's energy needs. |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

PTS: 1                      CON: Cellular Regulation

5. ANS: 4

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 3

Heading: Cell Structure and Function>Mitochondria

Integrated Process: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Moderate

| Feedback |                                                                                                                                                                                                                                |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | This is incorrect. Protein synthesis is the function of ribosomes. An increase in the synthesis of proteins does not yield energy and is not directly related to exercise.                                                     |
| 2        | This is incorrect. In aerobic energy metabolism created by exercise, anaerobic metabolism, also referred to as <i>glycolysis</i> , occurs outside the mitochondria. In anaerobic metabolism, glucose is used to create energy. |
| 3        | This is incorrect. Conversion of pyruvic acid to lactic acid in cellular hypoxia is noxious to cells and does not create energy.                                                                                               |
| 4        | This is correct. Exercise stimulates mitochondria found in the muscle cells to create energy. This process is supported by the increased number of mitochondria found in muscle cells.                                         |

PTS: 1                      CON: Cellular Regulation

6. ANS: 3

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 4

Heading: Cell Structure and Function>Ribosomes>Endoplasmic Reticulum

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Moderate

| Feedback |                                                                                                               |
|----------|---------------------------------------------------------------------------------------------------------------|
| 1        | This is incorrect. Ribosomal protein synthesis does not cease during endoplasmic reticulum stress.            |
| 2        | This is incorrect. ATP is synthesized in the energy metabolism. It does not interfere with protein synthesis. |

|   |                                                                                                                 |
|---|-----------------------------------------------------------------------------------------------------------------|
| 3 | This is correct. When the cells are deprived of adequate oxygen supply, the ribosomal protein synthesis ceases. |
| 4 | This is incorrect. The processing of prohormones to hormones does not cease the process of protein synthesis.   |

PTS: 1                      CON: Cellular Regulation

7. ANS: 1

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 5

Heading: Cell Structure and Function>Endoplasmic Reticulum>Microtubules and Microfilaments

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Knowledge [Remembering]

Concept: Cellular Regulation

Difficulty: Easy

| Feedback |                                                                                                                                                             |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | This is correct. The cilia are responsible for propelling the mucus and inhaled debris out of the lungs using a sweeping motion.                            |
| 2        | This is incorrect. Microfilaments help in changing the shape of certain cells, such as macrophages, and help with contraction of muscle.                    |
| 3        | This is incorrect. Secretory vesicles store substances, such as hormones, that are secreted by cells before they are released into the extracellular space. |
| 4        | This is incorrect. The endoplasmic reticulum aids in the transport of the synthesized protein from the ribosomes to the Golgi apparatus.                    |

PTS: 1                      CON: Cellular Regulation

8. ANS: 1

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 5

Heading: Cell Structure and Function>Endoplasmic Reticulum>Microtubules and Microfilaments

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Knowledge [Remembering]

Concept: Cellular Regulation

Difficulty: Easy

| Feedback |                                                                                                                                                                                                                                                                   |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | This is correct. Actin and myosin are the key proteins in the contractile unit of the muscle cells.                                                                                                                                                               |
| 2        | This is incorrect. Prohormone and tubulin are not the key elements in the contractile units of the muscle cells. Prohormones are transferred to the Golgi apparatus to be converted into complete hormones, and tubulin is associated with microtubule formation. |

|   |                                                                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | This is incorrect. Tubulin and actin are not the key proteins in the contractile units of the muscle cells. Microtubules are hollow filaments composed of tubulin. So tubulin is associated with microtubule formation. |
| 4 | This is incorrect. Prohormones are not one of the key proteins in the contractile units of the muscle cells. They are transferred to the Golgi apparatus to be converted into complete hormones.                        |

PTS: 1                      CON: Cellular Regulation

9. ANS: 4

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 5

Heading: Cell Structure and Function>Lysosomes>Lack of Lysosomal Enzymes and Disease

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Easy

|   | Feedback                                                                                                                                                                                                                                                                                                                                    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | This is incorrect. A deficiency of proteasome in the cell does not cause Tay–Sachs disease. Proteasome is an organelle that contains digestive enzymes similar to lysosomes. Proteasomes degrade polypeptide chains and proteins.                                                                                                           |
| 2 | This is incorrect. A deficiency of peroxisomes in the cell does not cause Tay–Sachs disease. Peroxisomes contain digestive enzymes such as lysosomes. Peroxisomes break down the long-chain fatty acids and free radicals.                                                                                                                  |
| 3 | This is incorrect. A deficiency of macrophages in the body does not cause Tay–Sachs disease. Macrophages are the major defensive white blood cells of the body. They contain a large number of lysosomes.                                                                                                                                   |
| 4 | This is correct. Lysosomes contain digestive enzymes such as lysozyme, proteases, and lipases to degrade the ingested foreign substances and cellular debris. Tay–Sachs disease is a rare genetic disorder that is caused by the deficiency of lysosomal enzymes. It results because of the buildup of lipids in the brain and spinal cord. |

PTS: 1                      CON: Cellular Regulation

10. ANS: 4

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 4

Heading: Cell Structure and Function>Proteasomes and Peroxisomes

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Moderate

|   | Feedback                                                                                                                                                                                                                                                                             |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | This is incorrect. The deficiency of lysosomal enzymes, as in Tay–Sachs disease, causes the accumulation of ganglioside in the central nervous system.                                                                                                                               |
| 2 | This is incorrect. Ribosomes are responsible for the synthesis of cellular proteins. In severe hypoxic states, ribosomal protein synthesis ceases, resulting in decreased synthesis of protein.                                                                                      |
| 3 | This is incorrect. Cachexia, or wasting of body mass, is associated with accelerated proteasome activity. It is often seen in conditions such as cancer.                                                                                                                             |
| 4 | This is correct. Adrenoleukodystrophy is associated with dysfunction of the peroxisomes. The disease is characterized by the accumulation of long-chain fatty acids in the nervous system. The disease causes the deterioration of the nervous system and eventually leads to death. |

PTS: 1                    CON: Cellular Regulation

11. ANS: 1

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 4

Heading: Cell Structure and Function>Endoplasmic Reticulum

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Comprehension [Understanding]

Concept: Cellular Regulation

Difficulty: Moderate

|   | Feedback                                                                                                                                                  |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | This is correct. Proteins are rapidly degraded during ER stress.                                                                                          |
| 2 | This is incorrect. Proteins cannot travel to their exact intracellular locations during ER stress.                                                        |
| 3 | This is incorrect. Accumulation of long-chain fatty acids in the nervous system is not associated with ER stress.                                         |
| 4 | This is incorrect. Accumulation of nondegraded substances in the cells occurs because of the lack of lysosomal enzymes, but not as a result of ER stress. |

PTS: 1                    CON: Cellular Regulation

12. ANS: 1

Chapter: Chapter 1, The Cell in Health and Illness

Objective: Recognize the major organelles and their function within the cell.

Page: 5

Heading: Cell Structure and Function>Endoplasmic Reticulum>Ribosomes

Integrated Processes: Nursing Process

Client Need: Physiological Integrity: Physiological Adaptation

Cognitive Level: Application [Applying]

Concept: Cellular Regulation

Difficulty: Difficult