

Essential Cell Biology 5th Edition Alberts Hopkin Test Bank

CHAPTER 1 Cells: The Fundamental Units of Life UNITY AND DIVERSITY OF CELLS

- 1.1.a Compare, with examples, some ways in which cells may vary in appearance and function.
- 1.1.b Outline, with examples, ways in which cells share a basic fundamental chemistry.
- 1.1.c Explain how the relationship between DNA, RNA, and protein—as laid out in the central dogma—makes the self-replication of living cells possible.
- 1.1.d Summarize how the processes of mutation and selection promote the gradual evolution of individuals best suited for survival in a wide range of habitats.
- 1.1.e Explain how differentiated cell types can vary widely in form and function despite having the same genome sequence.

CELLS UNDER THE MICROSCOPE

- 1.2.a List the three tenets of cell theory and explain their ramifications for the study of cell biology.
- 1.2.b Contrast light microscopy, super-resolution fluorescence light microscopy, and electron microscopy in terms of the cell components that can generally be distinguished using each.
- 1.2.c Compare how samples are prepared for light versus electron microscopy and explain how these preparations affect whether the technique can be used for viewing living cells or tissues.

THE PROKARYOTIC CELL

- 1.3.a Describe the structural differences between prokaryotes and eukaryotes.
- 1.3.b Analyze how eukaryotic cells and organisms rely on the function of prokaryotic cells and their descendants.
- 1.3.c Compare prokaryotes and eukaryotes in terms of their relative preponderance on Earth, their range of habitat, and their tendency toward multicellularity.
- 1.3.d Justify the division of prokaryotes into bacteria and archaea.

THE EUKARYOTIC CELL

- 1.4.a State the function of the nucleus and describe its structural features.
- 1.4.b Explain how the structure of the mitochondrion supports its function.
- 1.4.c Outline the evolution of mitochondria and chloroplasts and cite the evidence for these origins.
- 1.4.d Explain how chloroplasts and mitochondria cooperate as plant cells convert light energy into chemical energy.
- 1.4.e Compare the function of lysosomes and peroxisomes.
- 1.4.f Compare the structure, location, and function of the endoplasmic reticulum and Golgi apparatus.

- 1.4.g Outline the role that transport vesicles play in endocytosis, exocytosis, and the movement of materials between one membrane-enclosed organelle and another.
- 1.4.h Relate the location of the cytosol with respect to the cell's membrane-enclosed organelles.
- 1.4.i List the three major filaments of the cytoskeleton and contrast the roles they have in animal cells.
- 1.4.j Outline the role the cytoskeleton has in plant cells.
- 1.4.k Describe the ancestral cell that likely engulfed the aerobic bacteria that gave rise to mitochondria and explain why this event is thought to have preceded the acquisition of chloroplasts.

MODEL ORGANISMS

- 1.5.a Review why scientists study model organisms.
- 1.5.b Compare *E. coli*, *S. cerevisiae*, and *A. thaliana* and list the types of discoveries made by studying each.
- 1.5.c Compare flies, worms, fish, and mice as model organisms and name a benefit of studying each.
- 1.5.d Review the benefits of studying cultured human cells.
- 1.5.e Assess the relationship between genome size and gene number.
- 1.5.f Explain the significance of homologous genes and proteins.
- 1.5.g Summarize the roles played by the nucleotide sequences contained in an organism's genome.
- 1.5.h Outline an experiment that would allow investigators to determine whether proteins from different eukaryotes are functionally interchangeable.

MULTIPLE CHOICE

1. Living systems are incredibly diverse in size, shape, environment, and behavior. It is estimated that there are between 10 million and 100 million different species. Despite this wide variety of organisms, it remains difficult to define what it means to say something is alive. Which of the following can be described as the smallest living unit?
- DNA
 - cell
 - organelle
 - protein
- ANS: b DIF: Easy REF: 1.1 OBJ: 1.1.b Outline, with examples, ways in which cells share a basic fundamental chemistry. MSC: Understanding
2. The central dogma provides a framework for thinking about how genetic information is copied and used to produce structural and catalytic components of the cell. From the choices below, select the order of biochemical processes that best correlates with the tenets of the central dogma.
- replication, transcription, translation
 - replication, translation, transcription
 - translation, transcription, replication
 - translation, replication, transcription

ANS: A DIF: Easy REF: 1.1 OBJ: 1.1.c Explain how the relationship between DNA, RNA, and protein—as laid out in the central dogma—makes the self-replication of living cells possible. MSC: Understanding

3. Proteins are important architectural and catalytic components within the cell, helping to determine its chemistry, its shape, and its ability to respond to changes in the environment. Remarkably, all of the different proteins in a cell are made from the same 20 _____. By linking them in different sequences, the cell can make protein molecules with different conformations and surface chemistries, and therefore different functions.
- nucleotides
 - sugars
 - amino acids
 - fatty acids

ANS: C DIF: Easy REF: 1.1 OBJ: 1.1.b Outline, with examples, ways in which cells share a basic fundamental chemistry. MSC: Remembering

4. Which statement is NOT true about mutations?
- A mutation is a change in the DNA that can generate offspring less fit for survival than their parents.
 - A mutation can be a result of imperfect DNA duplication.
 - A mutation is a result of sexual reproduction.
 - A mutation is a change in the DNA that can generate offspring that are as fit for survival as their parents are.

ANS: C DIF: Easy REF: 1.1 OBJ: 1.1.d Summarize how the processes of mutation and selection promote the gradual evolution of individuals best suited for survival in a wide range of habitats. MSC: Analyzing

5. Changes in DNA sequence from one generation to the next may result in offspring that are altered in fitness compared with their parents. The process of change and selection over the course of many generations is the basis of
- mutation.
 - evolution.
 - heredity.
 - reproduction.

ANS: B DIF: Easy REF: 1.1 OBJ: 1.1.d Summarize how the processes of mutation and selection promote the gradual evolution of individuals best suited for survival in a wide range of habitats. MSC: Understanding

6. Select the option that BEST finishes the following statement: Evolution is a process
- that can be understood based on the principles of mutation and selection.
 - that results from repeated cycles of adaptation over billions of years.
 - by which all present-day cells arose from 4–5 different ancestral cells.
 - that requires hundreds of thousands of years.

ANS: A DIF: Moderate REF: 1.1 OBJ: 1.1.d Summarize how the processes of mutation and selection promote the gradual evolution of individuals best suited for survival in a wide range of habitats. MSC: Analyzing

7. Select the option that correctly finishes the following statement: A cell's genome
- is defined as all the genes being used to make protein.
 - contains all of a cell's DNA.

- c. constantly changes, depending upon the cell's environment.
- d. is altered during embryonic development.

ANS: B DIF: Easy REF: 1.1 OBJ: 1.1.b Outline, with examples, ways in which cells share a basic fundamental chemistry. MSC: Remembering

8. Which statement is NOT true about the events/conclusions from studies during the mid-1800s surrounding the discovery of cells?
- a. Cells came to be known as the smallest universal building block of living organisms.
 - b. Scientists came to the conclusion that new cells can form spontaneously from the remnants of ruptured cells.
 - c. Light microscopy was essential in demonstrating the commonalities between plant and animal tissues.
 - d. New cells arise from the growth and division of previously existing cells.

ANS: B DIF: Easy REF: 1.2 OBJ: 1.2.a List the three tenets of cell theory and explain their ramifications for the study of cell biology. MSC: Remembering

9. What unit of length would you generally use to measure a typical plant or animal cell?
- a. centimeters
 - b. nanometers
 - c. millimeters
 - d. micrometers

ANS: D DIF: Easy REF: 1.1 OBJ: 1.1.a Compare, with examples, some ways in which cells may vary in appearance and function. | 1.2.a List the three tenets of cell theory and explain their ramifications for the study of cell biology. MSC: Remembering

10. Cell biologists employ targeted fluorescent dyes or modified fluorescent proteins in both standard fluorescence microscopy and confocal microscopy to observe specific details in the cell. Even though fluorescence permits better visualization, the resolving power is essentially the same as that of a standard light microscope because the resolving power of a fluorescent microscope is still limited by the _____ of visible light.
- a. absorption
 - b. intensity
 - c. filtering
 - d. wavelength

ANS: D DIF: Moderate REF: 1.2 OBJ: 1.2.b Contrast light microscopy, super-resolution fluorescence light microscopy, and electron microscopy in terms of the cell components that can generally be distinguished using each. MSC: Understanding

11. What is the smallest distance two points can be separated and still resolved using light microscopy?
- a. 20 nm
 - b. 0.2 μm
 - c. 2 μm
 - d. 200 μm

ANS: B DIF: Moderate REF: 1.2 OBJ: 1.2.b Contrast light microscopy, super-resolution fluorescence light microscopy, and electron microscopy in terms of the cell components that can generally be distinguished using each.

MSC: Understanding

12. Prokaryotic cells do not possess
- a nucleus.
 - replication machinery.
 - ribosomes.
 - membrane bilayers.

ANS: A DIF: Easy REF: 1.3 OBJ: 1.3.a Describe the structural differences between prokaryotes and eukaryotes.

MSC: Remembering

13. Which three characteristics best support the rapid evolution of prokaryotic populations?
- microscopic, motile, anaerobic
 - aerobic, motile, rapid growth
 - no organelles, cell wall, can exchange DNA
 - large population, rapid growth, can exchange DNA

ANS: D DIF: Easy REF: 1.3 OBJ: 1.3.c Compare prokaryotes and eukaryotes in terms of their relative preponderance on Earth, their range of habitat, and their tendency toward multicellularity. MSC: Analyzing

14. The world of prokaryotes is divided into two domains (bacteria and archaea), each as different from each other as from eukaryotes. Select the observable characteristic that BEST separates archaea from bacteria.
- can metabolize inorganic substances
 - are found in extremely harsh environments
 - thrive in anaerobic conditions
 - are photosynthetic organisms

ANS: B DIF: Easy REF: 1.3 OBJ: 1.3.d Justify the division of prokaryotes into bacteria and archaea.

MSC: Remembering

15. The _____ is made up of two concentric membranes and is continuous with the membrane of the endoplasmic reticulum.
- plasma membrane
 - Golgi network
 - mitochondrial membrane
 - nuclear envelope

ANS: D DIF: Easy REF: 1.4 OBJ: 1.4.a State the function of the nucleus and describe its structural features.

MSC: Remembering

16. The nucleus, an organelle found in eukaryotic cells, confines the _____, keeping them separated from other components of the cell.
- lysosomes
 - chromosomes
 - peroxisomes
 - ribosomes

ANS: B DIF: Easy REF: 1.4 OBJ: 1.4.a State the function of the nucleus and describe its structural features.

MSC: Remembering

17. Which of the following organelles has both an outer and an inner membrane?
- endoplasmic reticulum
 - mitochondrion
 - lysosome
 - peroxisome

ANS: B DIF: Easy REF: 1.4 OBJ: 1.4.b Express how the structure of the mitochondrion supports its function.

MSC: Remembering

18. Mitochondria perform cellular respiration, a process that uses oxygen, generates carbon dioxide, and produces chemical energy for the cell. Which answer below indicates a correct pairing of the material “burned” and the form of energy produced during cellular respiration?
- fat, ADP
 - sugar, fat
 - sugar, ATP
 - fat, protein

ANS: C DIF: Easy REF: 1.4 OBJ: 1.4.d Explain how chloroplasts and mitochondria cooperate as plant cells convert light energy into chemical energy. MSC: Understanding

19. Mitochondria contain their own genome, are able to duplicate, and actually divide on a different time line from the rest of the cell. Nevertheless, mitochondria cannot function for long when isolated from the cell because they are
- viruses.
 - parasites.
 - endosymbionts.
 - anaerobes.

ANS: C DIF: Easy REF: 1.4 OBJ: 1.4.b Explain how the structure of the mitochondrion supports its function.

MSC: Remembering

20. The mitochondrial proteins found in the inner membrane are involved in the conversion of ADP to ATP, a source of energy for the cell. This process consumes which of the following substances?
- oxygen
 - nitrogen
 - sulfur
 - carbon dioxide

ANS: A DIF: Easy REF: 1.4 OBJ: 1.4.b Explain how the structure of the mitochondrion supports its function. | 1.4.d Explain how chloroplasts and mitochondria cooperate as plant cells convert light energy into chemical energy.

MSC: Remembering

21. Chloroplasts are complex organelles present in all photosynthesizing eukaryotes. Three different membranes create chemically different environments inside the chloroplast. Precisely where are chlorophyll molecules localized in the chloroplast?
- in the first, outer membrane

- b. in the space between the first and second membranes
- c. in the second, inner membrane
- d. in the third, innermost membrane

ANS: D DIF: Easy REF: 1.4 OBJ: 1.4.d Explain how chloroplasts and mitochondria cooperate as plant cells convert light energy into chemical energy. MSC: Remembering

22. Photosynthesis enables plants to capture the energy from sunlight. In this essential process, plants incorporate the carbon from CO₂ into high-energy _____ molecules, which the plant cell mitochondria use to produce ATP.
- a. fat
 - b. sugar
 - c. protein
 - d. fiber

ANS: B DIF: Easy REF: 1.4 OBJ: 1.4.d Explain how chloroplasts and mitochondria cooperate as plant cells convert light energy into chemical energy. MSC: Remembering

23. Which of the following choices BEST describes the role of the lysosome?
- a. transport of material to the Golgi apparatus
 - b. clean-up, recycling, and disposal of macromolecules
 - c. sorting of transport vesicles
 - d. the storage of excess macromolecules

ANS: B DIF: Easy REF: 1.4 OBJ: 1.4.e Compare the function of lysosomes and peroxisomes. MSC: Remembering

24. The cell constantly exchanges materials by bringing nutrients in from the external environment and shuttling unwanted by-products back out. Which term describes the process by which external materials are captured inside transport vesicles and brought into the cell?
- a. degradation
 - b. exocytosis
 - c. phagocytosis
 - d. endocytosis

ANS: D DIF: Easy REF: 1.4 OBJ: 1.4.g Outline the role that transport vesicles play in endocytosis, exocytosis, and the movement of materials between one membrane-enclosed organelle and another. MSC: Remembering

25. Eukaryotic cells are able to trigger the release of material from secretory vesicles to the extracellular space using a process called exocytosis. An example of materials commonly released this way is
- a. hormones.
 - b. nucleic acids.
 - c. sugars.
 - d. cytosolic proteins.

ANS: A DIF: Easy REF: 1.4 OBJ: 1.4.g Outline the role that transport vesicles play in endocytosis, exocytosis, and the movement of materials between one membrane-enclosed organelle and another. MSC: Remembering

26. _____ are fairly small organelles that provide a safe place within the cell to carry out certain biochemical reactions that generate harmful, highly reactive oxygen species. These chemicals are both generated and broken