ANSWERS TO CHAPTER 3

CONTENT LEARNING ACTIVITY

Cell Structure and Function
1. Organelle; 2. Nucleus; 3. Cytoplasm; 4. Cell membrane

Cell Membrane
A. 1. Extracellular; 2. Intracellular
B. 1. Phospholipid; 2. Polar; 3. Nonpolar; 4. Cholesterol; 5. Protein
C. 1. Phospholipid bilayer; 2. Polar region of phospholipid; 3. Nonpolar region of phospholipid; 4. Membrane channel protein; 5. Receptor molecule; 6. Cholesterol; 7. Protein; 8. Carbohydrate chains

Organelles and Cell Functions
A. 1. Nucleus; 2. Nucleus; 3. Nucleolus; 4. Ribosome (Rough ER); 5. Smooth ER
B. 1. Golgi apparatus; 2. Secretory vesicle; 3. Lysosome; 4. Mitochondria
C. 1. Cytoskeleton; 2. Microtubules; 3. Microfilaments; 4. Intermediate filaments
D. 1. Cilia; 2. Flagellum; 3. Microvilli

Cell Diagram
1. Cilia; 2. Secretory vesicles; 3. Cell membrane; 4. Golgi apparatus; 5. Smooth endoplasmic reticulum; 6. Mitochondrion; 7. Rough endoplasmic reticulum; 8. Ribosome; 9. Nucleolus; 10. Vesicles; 11. Centrioles; 12. Nuclear envelope; 13. Nucleus; 14. Phagocytic vesicle; 15. Ribosome; 16. Lysosome; 17. Microvilli

Movement Through the Cell Membrane
1. Lipid bilayer; 2. Membrane channels; 3. Carrier molecules; 4. Vesicles; 5. Membrane channels; 6. Carrier molecules

Diffusion
1. Solvent; 2. Solute; 3. Diffusion; 4. Diffusion

Osmosis and Filtration
1. Osmosis; 2. Osmotic pressure; 3. Hypertonic; 4. Lysis; 5. Filtration

Mediated Transport Mechanisms
1. Facilitated diffusion; 2. Active transport; 3. Secondary active transport

Endocytosis and Exocytosis
1. Endocytosis; 2. Phagocytosis; 3. Exocytosis

Cell Metabolism
1. Glycolysis; 2. Aerobic respiration; 3. Aerobic respiration; 4. Aerobic respiration; 5. Anaerobic respiration; 6. Anaerobic respiration; 7. Anaerobic respiration

Protein Synthesis
1. Transcription; 2. mRNA; 3. tRNA; 4. Translation

Mitosis
A. 1. Diploid; 2. Autosomes; 3. XX
B. 1. Interphase; 2. Prophase; 3. Metaphase; 4. Anaphase; 5. Telophase
C. 1. Chromatids; 2. Centromere; 3. Spindle fibers
D. 1. Chromatin; 2. Prophase; 3. Centriole; 4. Centromere; 5. Chromatid; 6. Chromosome; 7. Metaphase; 8. Spindle fiber; 9. Anaphase; 10. Chromosome; 11. Telophase; 12. Nucleoli; 13. Nuclear membrane

Meiosis
1. Gametes; 2. Haploid; 3. Tetrad; 4. Interkinesis; 5. Crossing over and random distribution

Differentiation
1. The same; 2. Differentiation; 3. The same; 4. Different

QUICK RECALL

1. Secretory vesicle
2. Smooth endoplasmic reticulum
3. Nucleus
4. Microtubules
5. Microvilli
6. Golgi apparatus
7. Ribosome
8. Lysosome
9. Mitochondrion
10. Centrioles
11. Rough endoplasmic reticulum
12. Nucleoli
13. Cilia
14. Flagella
15. Microfilaments
16. Intermediate filaments
17. Basic unit of life, protection and support, movement, communication, cell metabolism and energy release, and inheritance
18. Phospholipids form the double layer of molecules that separates the inside of the cell from the outside. Proteins are membrane channels, carrier molecules, receptors, enzymes, and structural components.
19. Diffusion, osmosis, filtration, facilitated diffusion, active transport, phagocytosis, pinocytosis, and exocytosis
20. Hypotonic, isotonic, and hypertonic
21. Transcription and translation

WORD PARTS

1. intracellular
2. intercellular
3. isotonic
4. hypotonic
5. hypertonic
6. chromosome; ribosome; lysosome

MASTERY LEARNING ACTIVITY

1. B. Cytoplasm is found around the nucleus, which is the control center of the cell. The cell membrane regulates what materials enter or exit the cell.
2. E. Proteins act as carrier molecules, function as enzymes, form membrane channels, and function as receptor and marker molecules.
3. C. The nucleolus is inside the nucleus. The other organelles listed are outside.
4. B. Smooth endoplasmic reticulum produces lipids. Rough endoplasmic reticulum produces proteins.
5. D. The Golgi apparatus concentrates and packages materials to be secreted.
6. B. Mitochondria are the major site of ATP production.
7. C. Lipid-soluble molecules can diffuse through the cell membrane because they dissolve in the lipid bilayer. Small water-soluble molecules diffuse through membrane channels.
8. B. Solution A is 10% salt and 90% water, whereas solution B is 20% salt and 80% water. Substances diffuse from areas of higher concentration to areas of lower concentration. Thus water diffuses from solution A (90% water) to solution B (80% water), and salt diffuses from solution B (20% salt) to solution A (10% salt).
9. A. Facilitated diffusion moves materials with the concentration gradient, does not require the expenditure of energy, and does use a carrier molecule. Materials move through membrane channels by simple diffusion.
10. D. The sodium-potassium exchange pump moves Na^+ ions out of cells, resulting in a greater concentration of Na^+ ions outside the cell. As Na^+ ions diffuse back into the cell, they bind to carrier molecules that also transport glucose into the cell. The energy from the diffusing Na^+ ions makes it possible to move glucose against its concentration gradient, resulting in a greater concentration of glucose inside the cell than outside.
11. B. Pinocytosis uses a vesicle to move liquid into the cell. Phagocytosis moves particulate matter into cells, and exocytosis moves materials out of cells. Diffusion does not use vesicles.
12. D. Aerobic and anaerobic respiration both produce ATP molecules. During aerobic respiration, the carbon atoms of food molecules are used to form carbon dioxide. The oxygen required for aerobic respiration is used to form water.
13. A. Transcription occurs when a DNA molecule produces a mRNA molecule. During this process the sequence of nucleotides in DNA determines the sequence of nucleotides in mRNA. Translation occurs when the sequence of nucleotides in mRNA determines the sequence of amino acids in a protein.
14. B. A codon is three nucleotides in mRNA that determines what amino acid is added to a polypeptide chain at the ribosome. An anticodon is three nucleotides in tRNA that binds to the codon of mRNA.
15. A. Messenger RNA is produced by transcription in the nucleus.
16. A. At the ribosomes, mRNA and tRNA form proteins in the process of translation.
17. B. Each type of tRNA has an anticodon that makes it different from other tRNA molecules. Each type of tRNA binds to only one type of amino acid.
18. A. During translation mRNA binds to a ribosome, which then aligns tRNA so that the codon of mRNA binds to the anticodon of tRNA. When two tRNA molecules are properly aligned, the amino acids on each tRNA bind together, forming part of a protein. One of the tRNA is then released from the mRNA and the ribosome.
19. A. Inhibiting mRNA synthesis inhibits protein synthesis because, without mRNA, there is no set of instructions for the production of a protein at the ribosome.
20. E. All of the characteristics listed except gamete production occur by mitosis. Gamete production is the result of meiosis.
21. D. Chromatids are molecules of DNA duplicated during interphase. They are joined by the centromere and they separate during anaphase to become chromosomes.
22. D. During telophase new nuclei are formed and the cell begins to take on the appearance of an interphase cell.
23. B. Meiosis results in the daughter cells having one half of the number of chromosomes as the parent cell. Specifically, one half of the autosomal chromosomes and one half of the sex chromosomes.
24. B. Crossing over is an exchange of genetic material between the chromatids of the tetrads formed during the first division of meiosis.
25. D. XY combination produces a male, and XX produces a female.

FINAL CHALLENGES

1. D. Numerous mitochondria suggest that ATP molecules are used by the cell for active transport. The microvilli increase the surface area of the cell membrane. It is likely that the cell uses active transport to move substances across the cell membrane.

   Lipid secretion is unlikely with the small amount of smooth endoplasmic reticulum, and protein secretion is unlikely with the small amount of rough endoplasmic reticulum. Few vesicles also suggest that exocytosis is not occurring.

2. A. A mature red blood cells still has mitochondria and is able to produce ATP. Without a nucleus, however, the red blood cell cannot perform transcription and produce mRNA. Without a nucleus, the red blood cell does not have a nucleolus and is unable to produce ribosomes.

3. A. Hypotonic sweat is less concentrated than blood. Thus compared to blood, more water is lost than salts, and the concentration of the blood increases. As a result, cells have more water than blood, water moves from the cells into the blood, and the cells shrink.

4 B. Replacing the lost water and salts with distilled water results in a more dilute blood. Relatively speaking, the blood has more water than the cells, water moves from the blood into the cells, and the cells swell.

5. C. Because the ATP inhibitor greatly reduces the rate of transfer of the amino acid, it can be conclude that the transport mechanism requires energy. Of the transport mechanisms listed, only active transport uses energy.