

# AP Biology - Review Sheet for TEST #1 - Chapters 02 - 05

1. The atomic number of an element refers to the number of \_\_\_\_\_ in an atom.
  - A) protons and neutrons
  - B) protons
  - C) electrons
  - D) neutrons
2. Which of the following statements concerning electrons is not correct?
  - A) Electrons orbit the nucleus of an atom in defined orbitals.
  - B) The outer shell of all atoms must contain eight electrons.
  - C) An atom may have more than one valence shell.
  - D) Electrons are negatively charged particles.
3. The element with which of the following atomic numbers would be most stable?
  - A) 1
  - B) 3
  - C) 12
  - D) 18
4. How can you differentiate between an element and a molecule?
  - A) Molecules may be composed of different types of atoms, whereas elements are always composed of only one type of atom.
  - B) Molecules are composed of only one type of atom, whereas elements are composed of different types of atoms.
  - C) Molecules are elements.
  - D) Molecules always have larger atomic weights than elements.
5. The strongest chemical bonds occur when
  - A) two atoms share electrons in a covalent bond.
  - B) two atoms share electrons in an ionic bond.
  - C) hydrogen bonds are formed.
  - D) van der Waals forces are in effect.
6. You have discovered that a molecule is hydrophilic. What else do you know about this molecule?
  - A) It cannot form hydrogen bonds.
  - B) It is a polar molecule.
  - C) It has a partial positive region and a partial negative region.
  - D) Both b and c
7. The stability of the three-dimensional shape of many large molecules is dependent on
  - A) covalent bonds.
  - B) ionic bonds.
  - C) hydrogen bonds.
  - D) van der Waals attractions.
8. Why does ice float in water?
  - A) Ice is less dense than water.
  - B) There are no hydrogen bonds in ice.
  - C) Ice is denser than water.
  - D) Water has a higher heat capacity than ice.

9. Cola has a pH of 3; blood plasma has a pH of 7. The hydrogen ion concentration of cola is \_\_\_\_\_ than the hydrogen ion concentration of blood plasma.
- A) 4 times greater
  - B) 4 times lesser
  - C) 400 times greater
  - D) 10,000 times greater
10. If solution A has a pH of 2 and solution B has a pH of 8, which of the following statements is true?
- A) A is basic and B is acidic.
  - B) A is acidic and B is basic.
  - C) A is a base and B is an acid.
  - D) A has a greater  $[\text{OH}^-]$  than B.
11. One mole of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) weighs
- A) 180 grams.
  - B) 42 atomic mass units.
  - C) 96 grams.
  - D) 342 grams.
12. The role of a buffer is to
- A) allow the pH of a solution to vary widely.
  - B) make a solution basic.
  - C) maintain pH homeostasis.
  - D) disrupt pH homeostasis.
13. Which of the following statements about water is correct?
- A) Water has a low heat of vaporization.
  - B) Water has a high specific heat.
  - C) When water freezes, it gains energy from the environment.
  - D) None of the above
14. What occurs in a chemical reaction?
- A) The bonding partners of atoms remain constant during the reaction.
  - B) All reactions release energy as they proceed.
  - C) The bonding partners of atoms changes during the reaction.
  - D) Matter is either created or destroyed.
15. Which of the following statements concerning polymers is not true?
- A) Polymers are synthesized from monomers during condensation (dehydration synthesis).
  - B) Polymers are synthesized from monomers during hydrolysis.
  - C) Polymers can have various types of monomers.
  - D) Both b and c
16. You are a biochemist and have recently discovered a new macromolecule. Studies of the bond types found in this macromolecule reveal many hydrogen bonds and peptide bonds. You most likely have found what type of macromolecule?
- A) Carbohydrate
  - B) Lipid
  - C) Protein
  - D) Nucleic acid

17. An  $\alpha$  helix is an example of which level of protein structure?  
A) Primary  
B) Secondary  
C) Tertiary  
D) Quaternary
18. You have isolated a monomer with the following components: a phosphate group, a sugar, and a nitrogen-containing base. Polymers synthesized from this monomer belong to what class of macromolecule?  
A) Carbohydrate  
B) Lipid  
C) Protein  
D) Nucleic acid
19. Cellulose and starch are composed of the same monomers. Which of the following results in their being structurally and functionally different?  
A) They have different types of glycosidic linkages.  
B) They have different numbers of glucose monomers.  
C) They are held together by different bond types.  
D) None of the above
20. DNA utilizes the bases guanine, cytosine, thymine, and adenine. In RNA, \_\_\_\_\_ is replaced by \_\_\_\_\_.  
A) adenine; arginine  
B) thymine; uracil  
C) cytosine; uracil  
D) cytosine; arginine
21. The pairing of purines with pyrimidines to create a double-stranded DNA molecule is called  
A) complementary base pairing.  
B) phosphodiester linkages.  
C) antiparallel synthesis.  
D) dehydration.
22. Triglycerides are synthesized from  
A) glycerol and amino acids.  
B) fatty acids and glycerol.  
C) steroid precursors and starch.  
D) cholesterol and glycerol.
23. Amino acids are linked together into proteins by which of the following bond types?  
A) Noncovalent bonds  
B) Peptide bonds  
C) Phosphodiester bonds  
D) Both a and b
24. Which of the following characteristics differentiate carbohydrates from other macromolecule types?  
A) Carbohydrates are constructed of monomers that always have a ring structure.  
B) Carbohydrates never contain nitrogen.  
C) Carbohydrates consist of a carbon bonded to hydrogen and a hydroxyl group.  
D) None of the above

25. You have found a mass of cells in the sediment surrounding a thermal vent in the ocean floor. The salinity in the area is quite high. Upon microscopic examination of the cells, you find no evidence of membrane-enclosed organelles. How would you classify this cell?
- A) As a eukaryotic cell
  - B) As a prokaryotic cell
  - C) As a member of domain Archaea or Bacteria
  - D) Both b and c
26. Centrifugation of a cell results in the rupture of the cell membrane and the contents compacting into a pellet in the bottom of the centrifuge tube. Bathing this pellet with a glucose solution yields metabolic activity, including the production of ATP. One of the contents of this pellet is most likely which of the following?
- A) Cytosol
  - B) Mitochondria
  - C) Lysosomes
  - D) Golgi bodies
27. Eukaryotic cells are thought to be derived from prokaryotic cells that underwent phagocytosis without digestion of the phagocytized cell. This mutualistic relationship is explained by the \_\_\_\_\_ theory.
- A) endosymbiotic
  - B) cell
  - C) evolutionary
  - D) parasite
28. Though science fiction has produced stories like "The Blob," we don't see very many large single-celled organisms. Which of the following tends to limit cell size?
- A) The ability to maintain a continuous large membrane
  - B) The ability to reproduce a large cell
  - C) Surface area-to-volume ratios
  - D) All of the above
29. Microscopes are used to resolve images that cannot be seen with the unaided eye. Electron microscopes use \_\_\_\_\_ to resolve images, whereas light microscopes use \_\_\_\_\_ to resolve images.
- A) light and lenses; diffraction of electron beams
  - B) diffraction of electron beams; light and lenses
  - C) lasers; light and lenses
  - D) None of the above
30. What is the correct cellular function of the RER?
- A) DNA synthesis
  - B) Photosynthesis
  - C) Cellular respiration
  - D) Protein synthesis
31. Photosynthesis occurs in the \_\_\_\_\_.
- A) chloroplast
  - B) mitochondria
  - C) Golgi apparatus
  - D) nucleus
32. Lysosomes are involved in \_\_\_\_\_.
- A) DNA synthesis
  - B) breakdown of phagocytized material
  - C) protein folding
  - D) pigment production

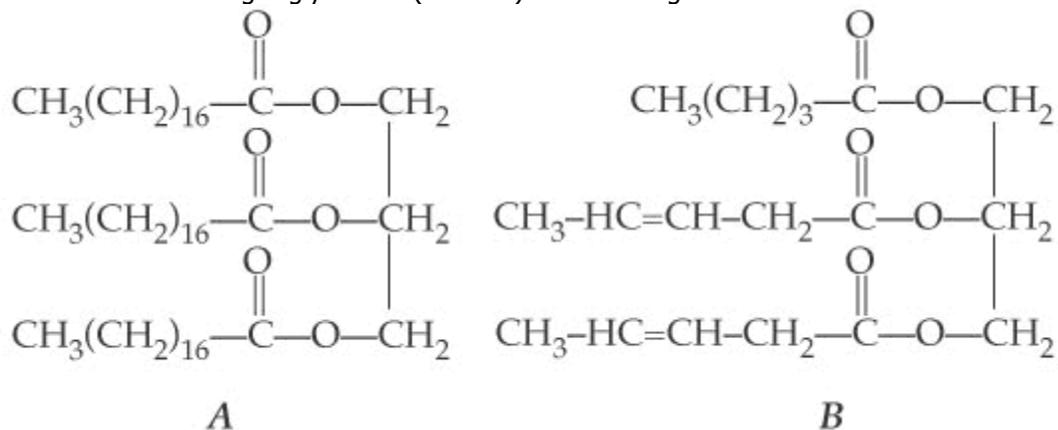
33. The packaging of proteins to be used outside the cell occurs in the \_\_\_\_\_.
- A) nucleus
  - B) SER
  - C) Golgi apparatus
  - D) chromoplast
34. Which of the following organelles are enclosed in double membranes?
- A) Nucleus
  - B) Chloroplast
  - C) Mitochondrion
  - D) All of the above
35. Movement of cells is accomplished in both prokaryotes and eukaryotes with which of the following structures?
- A) Cilia
  - B) Pili
  - C) Dynein
  - D) Flagella
36. Which of the following statements is true regarding mitochondria and chloroplasts?
- A) Animal cells produce chloroplasts.
  - B) Mitochondria and chloroplasts may be found in the same cell.
  - C) Mitochondria and chloroplasts are not found in the same cell.
  - D) Chloroplasts can revert to mitochondria in certain conditions.
37. Which of the following best describes ribosomes?
- A) Ribosomes guide protein synthesis.
  - B) Ribosomes are found only in the nucleus or on the RER.
  - C) There are no ribosomes in the mitochondria.
  - D) All of the above
38. Nuclear DNA exists as a complex of proteins called \_\_\_\_\_ that condenses into \_\_\_\_\_ during cellular division.
- A) chromosomes; chromatin
  - B) chromatids; chromosomes
  - C) chromophors; chromatin
  - D) chromatin; chromosomes
39. Rough endoplasmic reticulum and smooth endoplasmic reticulum differ
- A) only by the presence or absence of ribosomes.
  - B) both in the presence or absence of ribosomes and in their function.
  - C) only in microscopic appearance.
  - D) None of the above
40. Which of the following statements regarding cellular membranes is *not* true?
- A) The hydrophobic nature of the phospholipid tails limits the migration of polar molecules across the membrane.
  - B) Integral proteins and phospholipids move fluidly throughout the membrane.
  - C) Membrane phospholipids flip back and forth from one side of the bilayer to the other.
  - D) Glycolipids and glycoproteins serve as recognition sites on the cell membrane.
41. Which of the following contributes to differences in the two sides of the cell membrane?
- A) Differences in peripheral proteins
  - B) Different domains expressed on the ends of integral proteins
  - C) Differences in phospholipid types
  - D) All of the above

42. Which of the following cell membrane components serve as recognition signals for interactions between cells?
- A) Cholesterol
  - B) Glycolipids or glycoproteins
  - C) Phospholipids
  - D) All of the above
43. Which of the following types of junctions are responsible for communication between cells?
- A) Tight junctions
  - B) Desmosomes
  - C) Gap junctions
  - D) None of the above
44. You are monitoring the diffusion of a molecule across a membrane. Which of the following will result in the fastest rate of diffusion?
- A) An internal concentration of 5 percent and an external concentration of 60 percent
  - B) An internal concentration of 60 percent and an external concentration of 5 percent
  - C) An internal concentration of 35 percent and an external concentration of 40 percent
  - D) Both a and b
45. If a red blood cell with an internal salt concentration of about 0.85 percent is placed in a saline solution (salt solution) that is 4 percent, which of the following will most likely happen?
- A) The red blood cell will lose water and shrivel.
  - B) The red blood cell will gain water and burst.
  - C) The turgor pressure in the cell will greatly increase.
  - D) The cell will remain the same.
46. In which of the following is solution X hypotonic relative to solution Y?
- A) Solution X has a greater solute concentration than solution Y.
  - B) Solution X has a lower solute concentration than solution Y.
  - C) Solution X and solution Y have the same solute concentration.
  - D) None of the above
47. Which of the following statements regarding osmosis is not true?
- A) Osmosis refers to the movement of water along a concentration gradient.
  - B) In osmosis, water moves to equalize solute concentrations on either side of the membrane.
  - C) If osmosis occurs across a membrane, then diffusion is not occurring.
  - D) The movement of water across a membrane can affect the turgor pressure of some cells.
48. Channel proteins allow ions that would not normally pass through the cell membrane to pass through via the channel. What properties of the proteins are responsible for this?
- A) The channels are often composed of polar amino acid groups.
  - B) The channels are often composed of hydrophobic amino acid groups.
  - C) Both a and b
  - D) None of the above
49. Which of the following limits the movement of molecules when carrier-mediated facilitated diffusion is involved?
- A) Concentration gradient
  - B) Availability of carrier molecules
  - C) Temperature
  - D) All of the above

50. Active transport differs from passive transport in that active transport
- A) requires energy.
  - B) never requires direct input of ATP.
  - C) moves molecules with a concentration gradient.
  - D) Both a and c
51. Single-celled animals like amoebas engulf entire cells for food. Which of the following represents the manner in which amoebas "eat"?
- A) Exocytosis
  - B) Phagocytosis
  - C) Facilitative transport
  - D) Active transport
52. Sodium-potassium pumps are common in many cells. Which of the following are necessary for the pumps to work?
- A) ATP
  - B) A channel protein
  - C) No concentration gradient
  - D) All of the above
53. Bacterial cells are often found in very hypotonic environments. Which of the following characteristics keeps them from continuing to take on water from their environment?
- A) The presence of a cell wall allows a buildup of turgor pressure that prevents any more water from entering the cell.
  - B) The presence of a cell wall allows a buildup of tonic pressure that prevents any more water from entering the cell.
  - C) The cell expels water as fast as it takes it up.
  - D) None of the above
54. Which of the following may affect the rate of diffusion?
- A) Temperature
  - B) Molecule size
  - C) Concentration gradient
  - D) All of the above
55. Which of the following statements about carbohydrates is not true?
- A) Monomers of carbohydrates have six carbon atoms.
  - B) Monomers of carbohydrates are linked together during dehydration.
  - C) Carbohydrates are energy storage molecules.
  - D) None of the above
56. What would you expect to be true of the R groups of amino acids located on the surface of protein molecules found within the interior of biological membranes?
- A) The R groups would be hydrophobic.
  - B) The R groups would be hydrophilic.
  - C) The R groups would be polar.
  - D) The R groups would be able to form disulfide.
57. What characteristic of phospholipids allows them to form a bilayer?
- A) They have a hydrophilic fatty acid tail.
  - B) They have a hydrophobic head.
  - C) They have a hydrophobic fatty acid tail.
  - D) All of the above

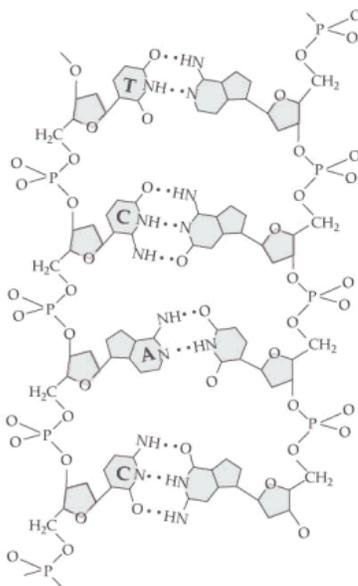
58. The double helix formation of DNA is due to \_\_\_\_\_.
- A) ionic bonds
  - B) covalent bonds
  - C) hydrogen bonds
  - D) hydrophobic side chains
59. Draw a phospholipid. What characteristics of phospholipids make them perfectly suited for membranes? What do you think might happen if phospholipids did not form a bilayer? How might they arrange themselves in an aqueous environment?
60. Discuss how a protein's three-dimensional structure makes it perfect for acting as a carrier and receptor molecule. Why are proteins uniquely suited for this function, whereas other macromolecules are not?
61. You have isolated a protein with the following amino acid sequence: RSCFLA. Using Table 3.2 in your book, draw this protein. In your drawing, label the N terminus and the C terminus and show all peptide linkages. How many water molecules were generated in the synthesis of this protein?

62. Consider the following triglycerides (A and B) in answering a–d.



- In B, circle the remnant of the glycerol portion of the triglyceride.
- Which triglyceride (A or B) is probably a solid at room temperature? Explain your answer.
- Which triglyceride (A or B) is probably derived from a plant? Explain your answer.
- How many water molecules result from the formation of triglyceride B from glycerol and three fatty acids?

63. Use the base-pairing rules for DNA and RNA to label the complementary strand of RNA (right) to the single strand of DNA (left) shown following, where C = cytosine, G = guanine, A = adenine, T = thymine, and U = uracil.

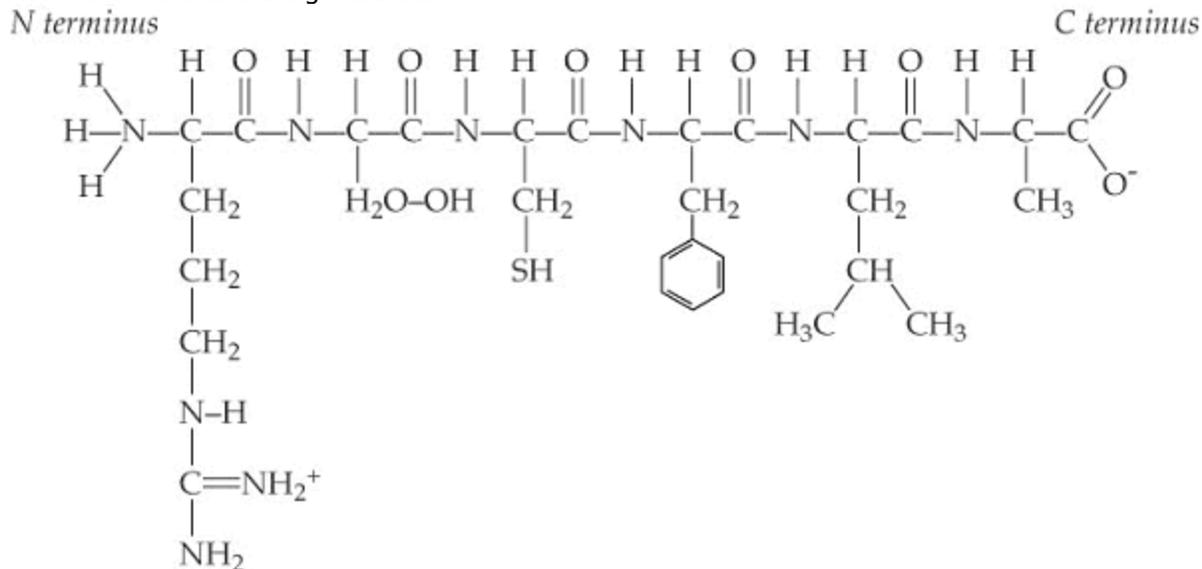


64. Compare and contrast prokaryotic and eukaryotic cells.
65. Explain the significance of organelles. What are the costs and benefits of having large compartmentalized cells?
66. What is the primary function of a cell membrane? What characteristics of membranes allow them to contribute to metabolic activity?
67. The organelles that contain their own DNA are all enclosed in double membranes. Relate this observation to the endosymbiotic theory.
68. Compare and contrast active and passive transport.
69. Barrier formation is only one function of the cell membrane. Describe some other functions of the membrane and discuss how the membrane is suited for those functions.

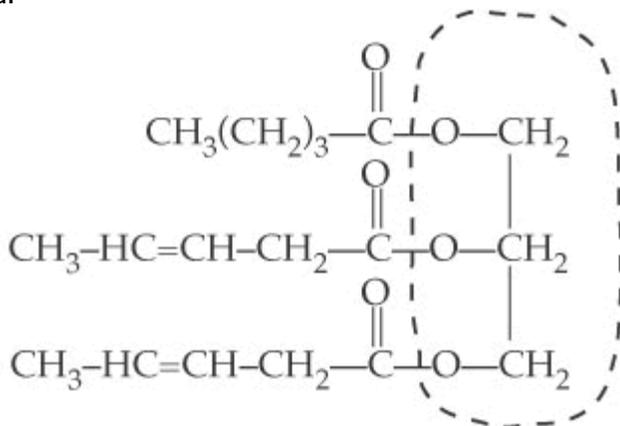
## Answer Key

1. B
2. B
3. D
4. A
5. A
6. D
7. C
8. A
9. D
10. B
11. A
12. C
13. B
14. C
15. B
16. C
17. B
18. D
19. A
20. B
21. A
22. B
23. B
24. C
25. B
26. B
27. A
28. C
29. B
30. D
31. A
32. B
33. C
34. D
35. D
36. B
37. A
38. D
39. B
40. C
41. D
42. B
43. C
44. D
45. A
46. B
47. C
48. A
49. D
50. A
51. B
52. A
53. A
54. D

55. A  
 56. A  
 57. C  
 58. C  
 59. See Figures 3.20 in your book for drawings of phospholipids. The hydrophilic head and the hydrophobic tail of phospholipids allow them to have an "inside" that resists an aqueous environment and an "outside" that can reside in such an environment. When they exist as a bilayer, the hydrophobic tails aggregate together. If they did not exist in two layers, the tails would still try to aggregate. This would result in a spherical aggregation of phospholipids called a micelle in which the tails are arranged toward the center of the sphere, away from the aqueous environment, and the heads are immersed in the aqueous environment.  
 60. The three-dimensional nature of proteins allows them to form binding sites. These binding sites are uniquely shaped to interact with other molecules.  
 61. Five water molecules are generated.

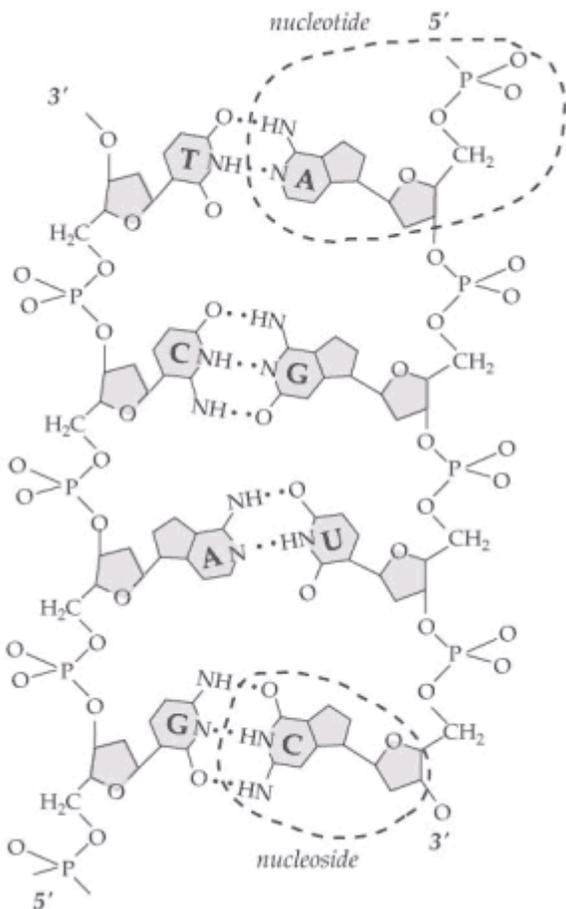


62. a.



- b. Triglyceride A is probably solid at room temperature. Its fatty acid chains are saturated (no double bonds) and relatively long, both characteristics of solid, animal-derived triglycerides.  
 c. Triglyceride B is probably derived from a plant. Its fatty acid chains are unsaturated (double bonds) and relatively short, both characteristics of liquid, plant-derived triglycerides.  
 d. Three water molecules will result. A water molecule results for each of the three fatty acids added to glycerol by a condensation reaction.

63.



64. Prokaryotic Cells

- Small in size
- No membrane-enclosed organelles
- Found only in domains Archaea and Bacteria
- DNA is in nucleoid

Eukaryotic Cells

- 10 or more times greater in size
- Membrane-enclosed organelles
- Found in all domains other than Archaea and Bacteria
- DNA is in nucleus

- 65. Organelles allow different metabolic environments to exist in the same cell. This partitioning of jobs allows for greater specialization but comes at an energy cost. Eukaryotic cells are more energy expensive.
- 66. A cell membrane exists to form an inside and an outside of a cell. The presence of an inside and an outside allows the establishment of different environments. In addition, membranes hold integral proteins with a variety of chemical properties and activities. This allows for the enzymatic activity associated with membranes. Stacks of membranes, such as those in mitochondria and chloroplasts, increase the amount of chemical activity in an area.
- 67. See Figure 4.26 for a description of the origin of double membranes from endosymbiosis.
- 68. The main difference between active and passive transport is that active transport goes against a concentration gradient and requires energy, whereas passive transport diffuses passively and does not require energy.
- 69. Membranes function in processing energy transformation and in the organization of chemical reactions. Integral and peripheral proteins contribute to these functions. The membrane serves as a holding site for the catalytic enzymes associated with these processes.