

Exam

Name _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

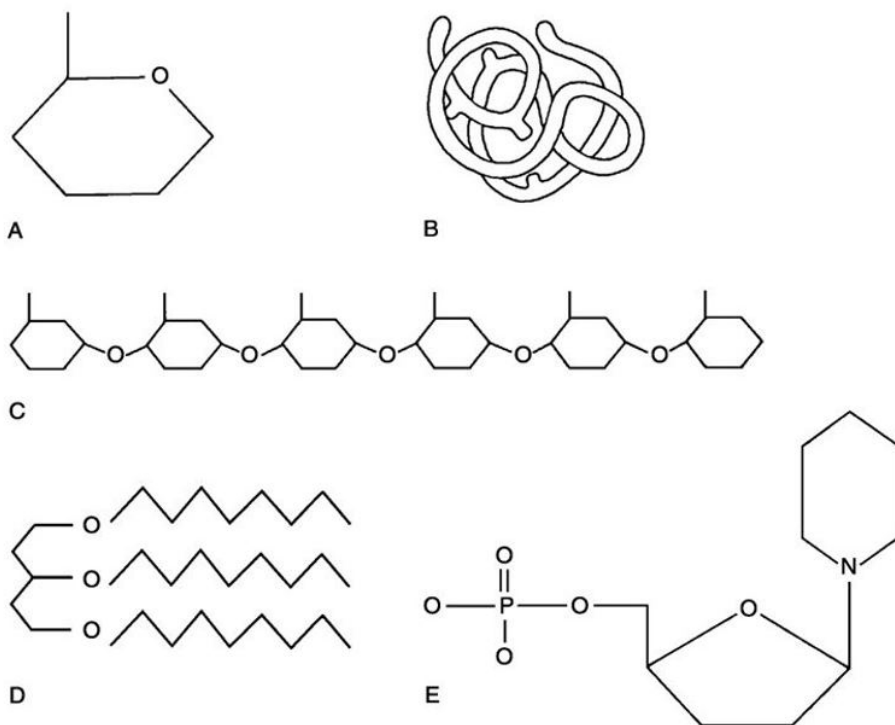


Figure 2.1

Using Figure 2.1, match the following:

- 1) Lipid.
Answer: D
- 2) Functional protein.
Answer: B
- 3) Nucleotide.
Answer: E
- 4) Polysaccharide.
Answer: C
- 5) Monosaccharide.
Answer: A
- 6) Polymer.
Answer: C

7) Tertiary (protein) structure.

Answer: B

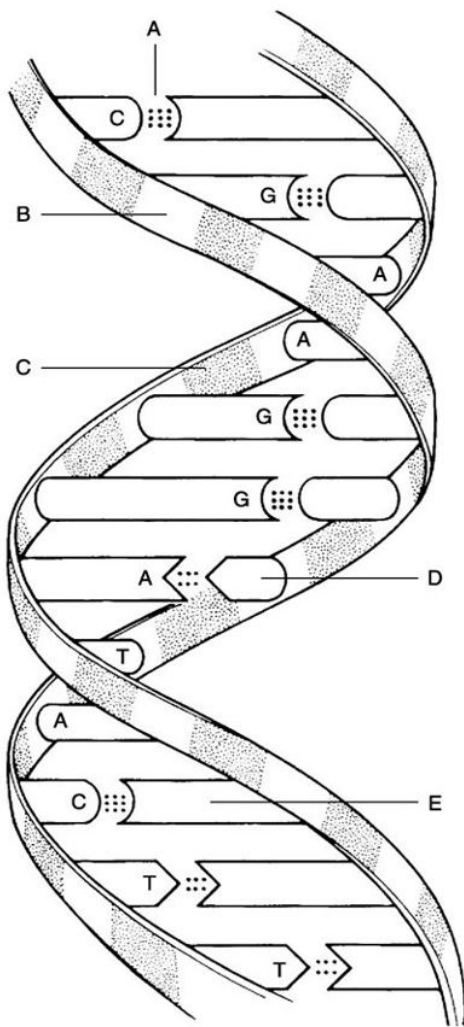


Figure 2.2

Using Figure 2.2, match the following:

8) Deoxyribose sugar.

Answer: B

9) Thymine.

Answer: D

10) Guanine.

Answer: E

11) Phosphate.

Answer: C

12) Hydrogen bonds.

Answer: A

MATCHING. Choose the item in column 2 that best matches each item in column 1.

Match the following chemical bonds to the correct description:

13) A bond in which electrons are shared unequally.

Answer: D

A) Nonpolar covalent bond

B) Hydrogen bond

14) A bond in which electrons are completely lost or gained by the atoms involved.

Answer: C

C) Ionic bond

D) Polar covalent bond

15) A bond in which electrons are shared equally.

Answer: A

16) A type of bond important in tying different parts of the same molecule together into a three-dimensional structure.

Answer: B

Match the following particles to the correct description:

17) Negatively charged subatomic particle.

Answer: D

A) Proton

B) Neutron

18) Neutral subatomic particle.

Answer: B

C) Atom

D) Electron

19) Smallest particle of an element that retains its properties.

Answer: C

20) Positively charged subatomic particle.

Answer: A

21) Subatomic particle having an AMU (Atomic Mass Unit) of zero.

Answer: D

Match the following:

22) Water.

Answer: A

A) Compound

23) Saline.

Answer: B

B) Solution

24) Dry ice (frozen carbon dioxide).

Answer: A

C) Suspension

25) Blood.

Answer: C

Match the following:

26) Can be measured only by its effects on matter.

Answer: B

A) Matter

B) Energy

27) Anything that occupies space and has mass.

Answer: A

C) Mass

D) Weight

28) Although a man who weighs 175 pounds on Earth would be lighter on the moon and heavier on Jupiter, his _____ would not be different.

Answer: C

29) Is a function of, and varies with, gravity.

Answer: D

Match the following:

30) Legs moving the pedals of a bicycle.

Answer: A

A) Mechanical energy

31) When the bonds of ATP are broken, energy is released to do cellular work.

Answer: C

A) Radiant energy

B) Electrical energy

32) Energy that travels in waves. Part of the electromagnetic spectrum.

Answer: A

C) Chemical energy

33) Represented by the flow of charged particles along a conductor, or the flow of ions across a membrane.

Answer: B

Match the following:

34) Protein structure achieved when alpha-helical or beta-pleated regions of the polypeptide chain fold upon one another to produce a compact ball-like, or *globular*, molecule.

Answer: B

A) Secondary

B) Tertiary

C) Quaternary

35) The sequence of amino acids that form the polypeptide chain.

Answer: D

D) Primary

36) Protein structure represented by alpha-helices and beta-sheets.

Answer: A

37) Two or more polypeptide chains, each with its own tertiary structure.

Answer: C

Match the following:

38) Usually, the first one or two letters of an element's name.

Answer: B

A) Atomic number

B) Atomic symbol

39) Number of protons in an atom.

Answer: A

C) Mass number of an element

40) Combined number of protons and neutrons in an atom.

Answer: C

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

41) The atomic number of any atom is equal to the number of electrons in its nucleus and is written as a subscript to the left of its atomic symbol.

Answer: True ☒ False

42) It is the difference in the R group that makes each amino acid chemically unique.

Answer: ☒ True False

43) Chemical properties are determined primarily by neutrons.

Answer: True ☒ False

44) A charged particle is generally called an ion or electrolyte.

Answer: ☒ True False

45) Isotopes differ from each other only in the number of electrons the atom contains.

Answer: True ☒ False

46) About 60% to 80% of the volume of most living cells consists of organic compounds.

Answer: True ☒ False

47) Triglycerides are a poor source of stored energy.

Answer: True ☒ False

48) Omega-3 fatty acids appear to decrease the risk of heart disease.

Answer: ☒ True False

49) Glucose is an example of a monosaccharide.

Answer: ☒ True False

50) Glycogen, the storage form of glucose, is primarily stored in skeletal muscle and liver cells.

Answer: ☒ True False

51) The lower the pH, the higher the hydrogen ion concentration.

Answer: ☒ True False

52) The sharing of electrons in covalent bonds makes them stronger than ionic and hydrogen bonds.

Answer: ☒ True False

53) Hydrogen bonds are too weak to bind atoms together to form molecules, but they do hold different parts of a single large molecule in a specific three-dimensional shape.

Answer: ☒ True False

54) The fact that no chemical bonding occurs between the components of a mixture is the chief difference between mixtures and compounds.

Answer: ☒ True False

55) The acidity of a solution reflects the concentration of free hydrogen ions in the solution.

Answer: ☒ True False

56) A chemical bond is an energy relationship between outer electrons and neighboring atoms.

Answer: ☒ True ☐ False

57) All organic compounds contain carbon except CO_2 and CO .

Answer: ☒ True ☐ False

58) A dipeptide can be broken into two amino acids by dehydration synthesis.

Answer: True ☒ False

59) The pH of body fluids must remain fairly constant for the body to maintain homeostasis.

Answer: ☒ True ☐ False

60) Mixtures are combinations of elements or compounds that are physically blended together but are not bound by chemical bonds.

Answer: ☒ True ☐ False

61) Buffers resist abrupt and large changes in the pH of body fluids by releasing or binding ions.

Answer: ☒ True ☐ False

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

62) Which of the following elements is necessary for proper conduction of nerve impulses?

- A) P B) Fe C) Na D) I

Answer: C

63) The basic structural material of the body consists of _____.

- A) nucleic acids B) lipids C) carbohydrates D) proteins

Answer: D

64) In general, the lipids that we refer to as oils at room temperature have _____.

- A) long fatty acid chains
B) unsaturated fatty acids
C) saturated fatty acids
D) a high water content

Answer: B

65) The genetic information is coded in DNA by the _____.

- A) three-dimensional structure of the double helix
B) regular alteration of sugar and phosphate molecules
C) sequence of the nucleotides
D) arrangement of the histones

Answer: C

66) Which of the following does NOT characterize proteins?

- A) They may be denatured or coagulated by heat or acidity.
B) They have both functional and structural roles in the body.
C) Their function depends on their three-dimensional shape.
D) They appear to be the molecular carriers of coded hereditary information.

Answer: D

67) The single most abundant protein in the body is _____.

- A) glucose B) DNA C) collagen D) hemoglobin

Answer: C

68) Carbohydrates are stored in the liver and skeletal muscles in the form of _____.

- A) glycogen B) cholesterol C) glucose D) triglycerides

Answer: A

69) Which of the following does NOT describe enzymes?

- A) Enzymes work by raising the energy of activation.
B) Some enzymes are purely protein.
C) Each enzyme is chemically specific.
D) Some enzymes are protein plus a cofactor.

Answer: A

70) Which of the following is a general function for a fibrous protein?

- A) transport
B) body defense
C) protein management
D) structural framework
E) catalysis

Answer: D

71) A chemical reaction in which bonds are created is usually associated with _____.

- A) forming a smaller molecule B) the release of energy
C) degradation D) the consumption of energy

Answer: D

72) Salts are always _____.

- A) hydrogen bonded B) double covalent compounds
C) ionic compounds D) single covalent compounds

Answer: C

73) The numbers listed represent the number of electrons in the first, second, and third energy levels, respectively. On this basis, which of the following is an unstable or reactive atom?

- A) 2, 8, 8 B) 2, 8, 1 C) 2, 8 D) 2

Answer: B

74) Which of the following statements is FALSE?

- A) When the hydrogen ion concentration decreases, the hydroxyl ion concentration also decreases.
B) The more hydrogen ions in a solution, the more acidic the solution.
C) When acids and bases are mixed, they react with each other to form water and a salt.
D) The pH of blood is slightly basic.

Answer: A

75) Which of the following is the major positive ion outside cells?

- A) hydrogen B) sodium C) potassium D) magnesium

Answer: B

76) Which of the following would be regarded as an organic molecule?

- A) CO_2 B) CH_4 C) H_2O D) NaOH

Answer: B

77) What is a chain of more than 50 amino acids called?

- A) triglyceride B) nucleic acid C) polysaccharide D) protein

Answer: D

78) What structural level is represented by the sequence of amino acids in a polypeptide chain?

- A) primary structure B) secondary structure
C) tertiary structure D) quaternary structure

Answer: A

79) Carbohydrates and proteins are built up from their basic building blocks by the _____.

- A) removal of a carbon atom between each two units
B) removal of a water molecule between each two units
C) addition of a water molecule between each two units
D) addition of a carbon atom between each two units

Answer: B

80) Which statement about enzymes is FALSE?

- A) Enzymes may use coenzymes derived from vitamins or cofactors from metallic elements.
B) Enzymes may be damaged by high temperature.
C) Most enzymes can catalyze millions of reactions per minute.
D) Enzymes require contact with substrate in order to assume their active form.

Answer: D

81) Which of the following statements is FALSE?

- A) Chemical reactions progress at a faster rate when the reacting particles are present in higher numbers.
B) Catalysts increase the rate of chemical reactions, sometimes while undergoing reversible changes in shape.
C) Larger particles move faster than smaller ones and thus collide more frequently and more forcefully.
D) Chemical reactions proceed more quickly at higher temperatures.

Answer: C

82) Choose the answer that best describes HCO_3^- .

- A) a weak acid B) a proton donor
C) common in the liver D) a bicarbonate ion

Answer: D

83) Select which reactions will usually be irreversible regarding chemical equilibrium in human bodies.

- A) $\text{ADP} + \text{Pi}$ to make ATP B) glucose to CO_2 and H_2O
C) $\text{H}_2\text{O} + \text{CO}_2$ to make H_2CO_3 D) glucose molecules joined to make glycogen

Answer: B

84) What happens in redox reactions?

- A) the organic substance that loses hydrogen is usually reduced
- B) the reaction is uniformly reversible
- C) both decomposition and electron exchange occur
- D) the electron acceptor is oxidized

Answer: C

85) Which type of proteins can function as chemical messengers or as receptors in the plasma membrane?

- A) enzyme
- B) communication
- C) defensive
- D) transport

Answer: B

86) Which of the following does NOT describe uses for the ATP molecule?

- A) mechanical work
- B) chemical work
- C) transport down their concentration gradient
- D) pigment structure

Answer: D

87) Select the most correct statement regarding nucleic acids.

- A) DNA is a long, double-stranded molecule made up of A, T, G, and C bases.
- B) Three forms exist: DNA, RNA, and tDNA.
- C) RNA is a long, single-stranded molecule made up of the bases A, T, G, and C.
- D) tDNA is considered a "molecular slave" of DNA during protein synthesis.

Answer: A

88) Which of the following is an example of a suspension?

- A) salt water
- B) cytosol
- C) rubbing alcohol
- D) blood

Answer: D

89) If the atomic mass of an element is 14 and the atomic number is 6, which of the following would describe this element?

- A) isotope
- B) atom
- C) neutral
- D) ion

Answer: A

90) The four elements that make up about 96% of body weight are _____.

- A) nitrogen, hydrogen, calcium, sodium
- B) carbon, oxygen, hydrogen, nitrogen
- C) sodium, potassium, hydrogen, oxygen
- D) carbon, oxygen, phosphorus, calcium

Answer: B

91) _____ is fat soluble, produced in the skin on exposure to UV radiation, and necessary for normal bone growth and function.

- A) Vitamin D
- B) Vitamin K
- C) Vitamin A
- D) Cortisol

Answer: A

92) You notice that you cannot read your book through a test tube of patient fluid held against the print, making it so blurred as to be unreadable. There is no precipitant in the bottom of the beaker, though it has been sitting for several days in a rack. What type of liquid is this?

- A) suspension
- B) mixture
- C) solution
- D) colloid

Answer: D

101) What does CH₄ mean?

- A) There is one carbon and four hydrogen atoms.
- B) This was involved in a redox reaction.
- C) There are four carbon and four hydrogen atoms.
- D) This is an inorganic molecule.

Answer: A

102) Amino acids joining together to make a peptide is a good example of a(n) _____ reaction.

- A) reversible
- B) exchange
- C) decomposition
- D) synthesis

Answer: D

103) Which of the following is NOT considered a factor in influencing a reaction rate?

- A) particle size
- B) time
- C) temperature
- D) concentration of reactants

Answer: B

104) Which property of water is demonstrated when we sweat?

- A) high heat of vaporization
- B) polar solvent properties
- C) cushioning
- D) high heat capacity
- E) reactivity

Answer: A

105) Starch is a _____.

- A) polysaccharide
- B) triglyceride
- C) monosaccharide
- D) disaccharide

Answer: A

106) What is the ratio of fatty acids to glycerol in triglycerides (neutral fats)?

- A) 2:1
- B) 4:1
- C) 3:1
- D) 1:1

Answer: C

107) In a DNA molecule, the phosphate serves _____.

- A) as a code
- B) as nucleotides
- C) to bind the sugars to their bases
- D) to hold the molecular backbone together

Answer: D

108) When frying an egg, the protein albumin denatures and maintains only its _____ structure.

- A) primary
- B) tertiary
- C) secondary
- D) quaternary

Answer: A

109) Which of the following is chemically inert (unreactive)?

- A) sodium (atomic number 11)
- B) carbon (atomic number 6)
- C) oxygen (atomic number 8)
- D) neon (atomic number 10)

Answer: D

110) An atom with an atomic number of 10 and a mass number of 24 would have _____.

- A) 24 protons
- B) 10 neutrons
- C) 14 neutrons
- D) 14 electrons

Answer: C

119) Which of the following is *incorrectly* matched?

- A) amino acid; protein
- C) eicosanoid; triglyceride

- B) nucleotide; nucleic acid
- D) monosaccharide; carbohydrate

Answer: C

120) Starch is the stored carbohydrate in plants, while _____ is the stored carbohydrate in animals.

- A) glucose
- B) triglyceride
- C) glycogen
- D) cellulose

Answer: C

121) How many phosphates would ADP have attached to it?

- A) none
- B) three
- C) two
- D) one

Answer: C

122) Tendons are strong, rope-like structures that connect skeletal muscle to bone. Which of the following proteins would provide strength to a tendon?

- A) albumin
- B) molecular chaperone
- C) collagen
- D) actin

Answer: C

123) Phospholipids make up most of the lipid part of the cell membrane. Since water exists on both the outside and inside of a cell, which of the following phospholipid arrangements makes the most sense?

- A) two back-to-back phospholipid layers with the polar heads facing out on both sides
- B) a single layer of phospholipids with the polar heads facing outside the cell
- C) a single layer of phospholipids with the polar heads facing inside the cell
- D) two back-to-back phospholipid layers with the non-polar tails facing out on both sides

Answer: A

124) What type of chemical bond can form between an atom with 11 protons and an atom with 17 protons?

- A) hydrogen
- B) non-polar covalent
- C) polar covalent
- D) ionic

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

125) What happens when globular proteins are denatured?

Answer: The active sites are destroyed.

126) Explain the difference between potential and kinetic energy.

Answer: Potential energy is inactive stored energy that has potential to do work. Kinetic energy is energy in action.

127) How can phospholipids form a film when mixed in water?

Answer: Phospholipids have both polar and nonpolar ends. The polar end interacts with water, leaving the nonpolar end oriented in the opposite direction.

128) What properties does water have that make it a very versatile fluid?

Answer: High heat capacity, high heat of vaporization, polar solvent properties, reactivity, and cushioning.

129) What advantages does ATP have in being the energy currency molecule?

Answer: Its energy is easy to capture and store; it releases just the right amount of energy for the cell's needs so it is protected from excessive energy release. A universal energy currency is efficient because a single system can be used by all the cells in the body.

130) Explain why water is considered to have partial charges even though it is sharing electrons in a polar covalent bond.

Answer: Due to the electronegativity of oxygen, it pulls the shared electron more strongly than the hydrogen. As a result, the oxygen acquires a partial negative charge, and the hydrogens acquire a partial positive charge.

131) When a set of electrodes connected to a light bulb is placed in a solution of dextrose and a current is applied, the light bulb does not light up. When the same unit is placed in HCl, it does. Why?

Answer: HCl ionizes to form current-conducting electrolytes. Dextrose does not ionize, and therefore does not conduct current.

132) Describe the factors that affect chemical reaction rates.

Answer: Temperature increases kinetic energy and therefore the force of molecular collisions. Particle size: smaller particles move faster at the same temperature and therefore collide more frequently; also, smaller particles have more surface area given the same concentration of reactants. Concentration: the higher the concentration, the greater the chance of particles colliding. Catalysts increase the rate of the reaction at a given temperature. Enzymes are biological catalysts.

133) Protons and electrons exist in every atom nucleus except hydrogen. Is this statement true or false and why?

Answer: False. Hydrogen has one proton and one electron. It is the neutron, not the electron that can coexist in the nucleus and that hydrogen does not have.

134) A chemical bond never occurs between components of a mixture. Discuss this.

Answer: Mixtures come in three forms—solutions, colloids, and suspensions. Components of these mixtures always retain their original makeup and can be separated into their individual components; therefore, no chemical bonding has taken place.

135) All chemical reactions are theoretically reversible. Comment on this statement.

Answer: It is possible to reverse any reaction if the products are still present. Those that are only slightly exergonic are easily reversible. Some would require an enormous amount of energy to reverse. In the simple reaction $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$ the amount of energy it takes to reverse table salt to chlorine gas and sodium metal is enormous. When glucose is oxidized the energy goes into bonds of ATP molecules which are then spent and thus the energy is not available to reform glucose.

136) What is the major difference between polar and nonpolar covalent bonds?

Answer: Polar bonds have an unequal sharing of electrons resulting in a slight negative charge at one end of the molecule and a slight positive charge at the other end. Nonpolar bonds have an equal sharing of electrons, resulting in a balanced charge among the atoms.

137) An amino acid may act as a proton acceptor or donor. Explain.

Answer: Amino acids have two components—a base group (proton acceptor) and an organic acid part (a proton donor). Some have additional base or acid groups on the ends of their R groups as well.

138) Name at least four things you know about enzymes.

- Answer:
1. Most are proteins.
 2. They have specific binding sites for specific substrates.
 3. They lower the activation barrier for a specific reaction.
 4. The names often end in "Suffix: -ase."
 5. They can be denatured.
 6. They can be used again and again.

139) In the compound H_2CO_3 , what do the numbers 2 and 3 represent?

Answer: The 2 indicates that there are two hydrogen atoms in the compound and the 3 indicates that there are three oxygen atoms in the compound.

140) Are all chemical reactions reversible? If not, why aren't they all reversible?

Answer: All chemical reactions are theoretically reversible, but only if the products are not consumed and enough energy is available for the reaction.

141) If all protons, electrons, and neutrons are alike, regardless of the atom considered, what determines the unique properties of each element?

Answer: Atoms of different elements are composed of different numbers of protons, electrons, and neutrons.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

142) Mrs. Mulligan goes to her dentist and, after having a couple of cavities filled, her dentist strongly suggests that she reduce her intake of sodas and increase her intake of calcium phosphates in the foods she eats. Why?

Answer: Sodas are strong acids that can reduce bone and tooth salts. Calcium phosphate makes teeth hard and therefore more resistant to tooth decay.

143) Although his cholesterol levels were not high, Mr. Martinez read that cholesterol was bad for his health, so he eliminated all foods and food products containing this molecule. He later found that his cholesterol level dropped only 20%. Why did it not drop more?

Answer: Cholesterol is produced by the liver, in addition to being ingested in foods.

144) How can DNA be used to "fingerprint" a suspect in a crime?

Answer: The DNA of a person is unique to that individual. By obtaining the DNA from nucleated cells from the crime scene (e.g., blood, semen, other body tissues), enzymes may be used to break up the DNA into fragments. Because nearly everyone's DNA is different, it also breaks up into fragments differently. When the fragments are separated, they form patterns even more unique than fingerprint patterns. A match of suspect and crime scene DNA is strong evidence.

145) Why is it possible for us to drink a solution that contains a mixture of equal concentration of a strong acid and a strong base, either of which, separately, would be very caustic?

Answer: When an acid and base of equal strength are mixed, they undergo a displacement (neutralization) reaction to form water and a salt.

146) A 65-year-old patient came to the emergency room with complaints of severe heartburn unrelieved by taking a "large handful" of antacids. Would you expect the pH to be high or low? Explain why.

Answer: You would expect a high pH. Taking antacids will neutralize the acidic stomach. Taking a "handful" of antacids can cause an alkaloid state. Certain drugs, such as corticosteroids and antacids that contain baking soda, will lead to metabolic alkalosis.

- 147) A 22-year-old female college student is stressed out due to final exams and begins to hyperventilate. This means she is exhaling too much carbon dioxide. As a result, the pH of the blood will become too basic creating a homeostatic imbalance. Her friend hands her a paper bag and instructs her to inhale and exhale into the bag. Breathing in the bag helps to replace the lost carbon dioxide lowering the pH back to normal levels. Which buffer system in the body will be involved in this reaction?

Answer: The bicarbonate buffer system is going to be involved in this situation. In this buffer system, the weak acid is carbonic acid, which is formed from the reaction between carbon dioxide and water. The body responds to an increase in blood pH by shifting the equation to the left, causing carbonic acid to dissociate into bicarbonate and protons. These protons will bring the rising pH back to a normal level.

- 148) Brenda is a 26-year-old female who is being discharged from the hospital after a vaginal delivery of an 8-pound healthy infant. Brenda is instructed by the nurse to eat a diet high in fiber and to drink 8 glasses of water per day to prevent constipation. Explain the role of fiber and water to promote defecation.

Answer: Cellulose is a polysaccharide found in all plant products that adds bulk to the diet to promote feces through the colon. Water acts as a lubricating liquid within the colon, which eases feces through the bowel.