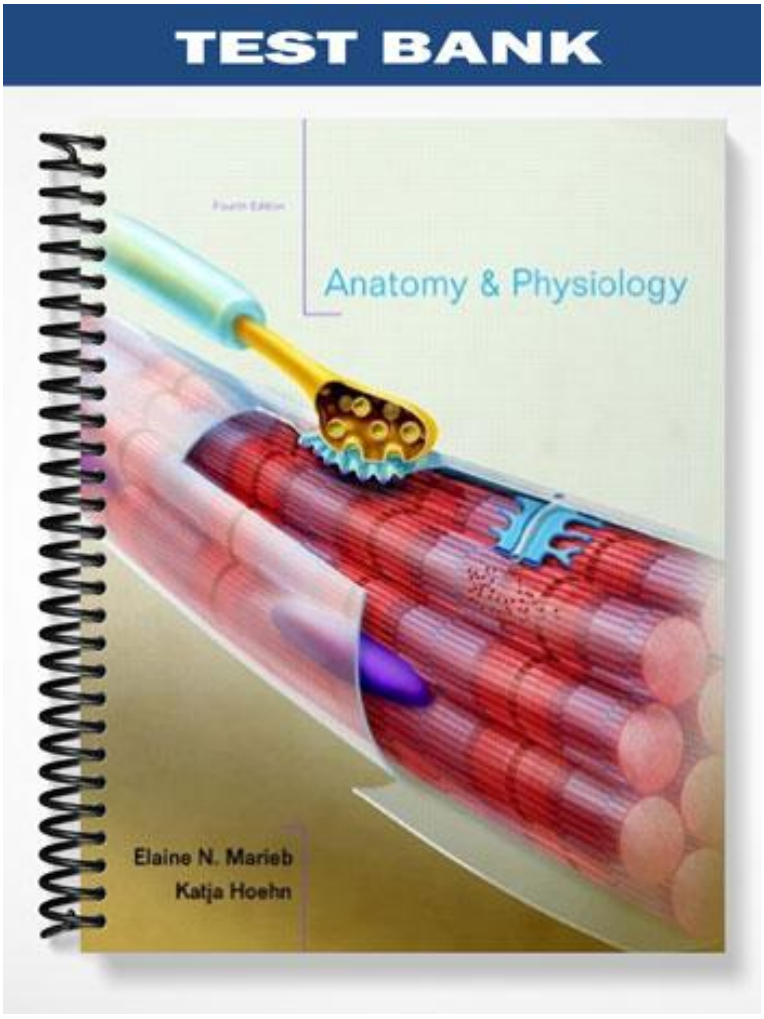
TEST BANK



***Anatomy and Physiology, 4e* (Marieb)**
Chapter 2 Chemistry Comes Alive

2.1 Matching Questions

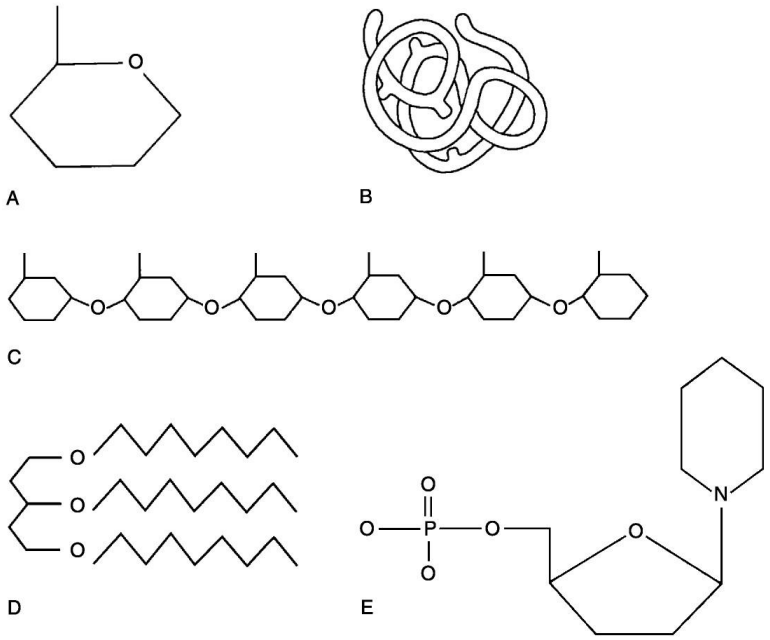


Figure 2.1

Using Figure 2.1, match the following:

1) Lipid.
Answer: D
Diff: 2 Page Ref: 39; Fig. 2.15b

2) Functional protein.
Answer: B
Diff: 2 Page Ref: 45; Fig. 2.19d

3) Nucleotide.
Answer: E
Diff: 2 Page Ref: 50; Fig. 2.22a

4) Polysaccharide.
Answer: C
Diff: 2 Page Ref: 39; Fig. 2.15c

5) Monosaccharide.
Answer: A
Diff: 2 Page Ref: 39; Fig. 2.15a

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6) Polymer.
Answer: C
Diff: 2 Page Ref: 39; Fig. 2.15c

7) Tertiary (protein) structure.
Answer: B
Diff: 2 Page Ref: 45; Fig. 2.19c

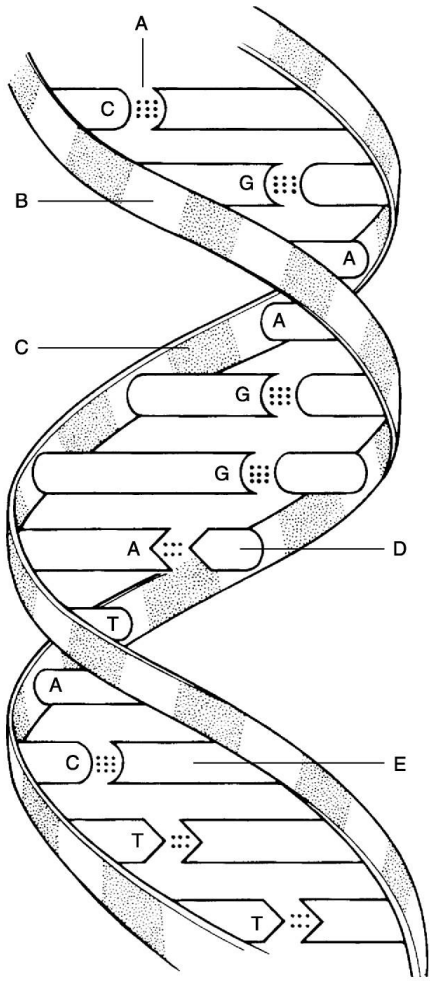

Figure 2.2

Using Figure 2.2, match the following:

8) Deoxyribose sugar.
Answer: B
Diff: 2 Page Ref: 50; Fig. 2.22

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9) Thymine.
Answer: D
Diff: 2 Page Ref: 50; Fig. 2.22

10) Guanine.
Answer: E
Diff: 2 Page Ref: 50; Fig. 2.22

11) Phosphate.
Answer: C
Diff: 2 Page Ref: 50; Fig. 2.22

12) Hydrogen bonds.
Answer: A
Diff: 3 Page Ref: 50; Fig. 2.22

Match the following chemical bonds to the correct description:

A) Nonpolar covalent bond
B) Ionic bond
C) Polar covalent bond
D) Hydrogen bond

13) A bond in which electrons are shared unequally.
Diff: 1 Page Ref: 30; Fig. 2.9

14) A bond in which electrons are completely lost or gained by the atoms involved.
Diff: 1 Page Ref: 27-28, 30

15) A bond in which electrons are shared equally.
Diff: 1 Page Ref: 30; Fig. 2.9

16) A type of bond important in tying different parts of the same molecule together into a three-dimensional structure.
Diff: 2 Page Ref: 30

Answers: 13) C 14) B 15) A 16) D

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Match the following particles to the correct description:

A) Cation
B) Neutron
C) Atom
D) Molecule

17) Electrically charged particle due to loss of an electron.
Diff: 1 Page Ref: 27

18) Neutral subatomic particle.
Diff: 1 Page Ref: 21

19) Smallest particle of an element that retains its properties.
Diff: 1 Page Ref: 21

20) Smallest particle of a compound that still retains its properties.
Diff: 2 Page Ref: 24

Answers: 17) A 18) B 19) C 20) D

Match the following:

A) Compound
B) Mixture
C) Element

21) Water.
Diff: 1 Page Ref: 24

22) Carbon.
Diff: 1 Page Ref: 21

23) Dry ice (frozen carbon dioxide).
Diff: 1 Page Ref: 24

24) Blood.
Diff: 1 Page Ref: 24-25

Answers: 21) A 22) C 23) A 24) B

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Match the following:

A) Energy
B) Mass
C) Weight
D) Matter

25) Can be measured only by its effects on matter.
Diff: 1 Page Ref: 20

26) Anything that occupies space and has mass.
Diff: 1 Page Ref: 19

27) Although a man who weighs 175 pounds on Earth would be lighter on the moon and heavier on Jupiter, his _____ would not be different.
Diff: 2 Page Ref: 19

28) Is a function of, and varies with, gravity.
Diff: 2 Page Ref: 19

Answers: 25) A 26) D 27) B 28) C

Match the following:

A) Chemical energy
B) Radiant energy
C) Electrical energy
D) Mechanical energy

29) Legs moving the pedals of a bicycle.
Diff: 1 Page Ref: 20

30) When the bonds of ATP are broken, energy is released to do cellular work.
Diff: 1 Page Ref: 20

31) Energy that travels in waves. Part of the electromagnetic spectrum.
Diff: 1 Page Ref: 20

32) Represented by the flow of charged particles along a conductor, or the flow of ions across a membrane.
Diff: 1 Page Ref: 20

Answers: 29) D 30) A 31) B 32) C

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Match the following:

A) Suspensions
B) Colloids
C) Solutions

33) Heterogeneous, will not settle.
Diff: 1 Page Ref: 26

34) Heterogeneous, will settle.
Diff: 1 Page Ref: 26

35) Homogeneous, will not settle.
Diff: 1 Page Ref: 24-25

36) Will not scatter light.
Diff: 1 Page Ref: 24-25

Answers: 33) B 34) A 35) C 36) C

2.2 True/False Questions

1) The atomic weight is only an average of relative weights of an atom and its isotopes, and it may vary from the weight of a specific isotope.
Answer: TRUE
Diff: 2 Page Ref: 23

2) Emulsions and colloids are the same thing.
Answer: TRUE
Diff: 1 Page Ref: 26

3) Chemical properties are determined primarily by neutrons.
Answer: FALSE
Diff: 1 Page Ref: 23

4) A charged particle is generally called an ion.
Answer: TRUE
Diff: 1 Page Ref: 27

5) Isotopes differ from each other only in the number of electrons contained.
Answer: FALSE
Diff: 1 Page Ref: 23

6) About 60% to 80% of the volume of most living cells consists of organic compounds.
Answer: FALSE
Diff: 1 Page Ref: 34

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7) Lipids are a poor source of stored energy.
Answer: FALSE
Diff: 1 Page Ref: 42; Tbl. 2.2

8) Current information theorizes that omega-3 fatty acids decrease the risk of heart disease.
Answer: TRUE
Diff: 1 Page Ref: 42

9) Glucose is an example of a monosaccharide.
Answer: TRUE
Diff: 1 Page Ref: 38-40

10) A molecule consisting of one carbon atom and two oxygen atoms is correctly written as CO_2.
Answer: TRUE
Diff: 1 Page Ref: 30; Fig. 2.8

11) The lower the pH, the higher the hydrogen ion concentration.
Answer: TRUE
Diff: 1 Page Ref: 36

12) Covalent bonds are generally less stable than ionic bonds.
Answer: FALSE
Diff: 2 Page Ref: 28-30

13) Hydrogen bonds are comparatively strong bonds.
Answer: FALSE
Diff: 1 Page Ref: 30

14) The fact that *no* chemical bonding occurs between the components of a mixture is the chief difference between mixtures and compounds.
Answer: TRUE
Diff: 1 Page Ref: 26

15) Alpha particles, although relatively weak energy particles, are second only to smoking as a cause of lung cancer.
Answer: TRUE
Diff: 1 Page Ref: 23-24

16) No chemical bonding occurs between the components of a mixture.
Answer: TRUE
Diff: 2 Page Ref: 26

17) All organic compounds contain carbon.
Answer: TRUE
Diff: 1 Page Ref: 37

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18) A dipeptide can be broken into two amino acids by dehydration synthesis.
Answer: FALSE
Diff: 1 Page Ref: 44; Fig. 2.18

19) The pH of body fluids must remain fairly constant for the body to maintain homeostasis.
Answer: TRUE
Diff: 1 Page Ref: 35-36

20) Mixtures are combinations of elements or compounds that are physically blended together but are not bound by chemical bonds.
Answer: TRUE
Diff: 2 Page Ref: 24

21) Buffers resist abrupt and large changes in the pH of the body by releasing or binding ions.
Answer: TRUE
Diff: 2 Page Ref: 36-37

2.3 Multiple-Choice Questions

1) Which of the following elements is necessary for proper conduction of nervous impulses?
A) Fe
B) I
C) P
D) Na
Answer: D
Diff: 2 Page Ref: 22; Tbl. 2.1

2) Choose the statement that is false or incorrect.
A) In chemical reactions, breaking old bonds requires energy and forming new bonds releases energy.
B) Exergonic reactions release more energy than they absorb.
C) Endergonic reactions absorb more energy than they release.
D) A key feature of the body's metabolism is the almost exclusive use of exergonic reactions by the body.
Answer: D
Diff: 3 Page Ref: 33

3) In general, the lipids that we refer to as oils have _____.
A) a high water content
B) long fatty acid chains
C) a high degree of saturated bonds
D) a high degree of unsaturated bonds
Answer: D
Diff: 2 Page Ref: 40-42

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4) The genetic information is coded in DNA by the _____.
A) regular alteration of sugar and phosphate molecules
B) sequence of the nucleotides
C) three-dimensional structure of the double helix
D) arrangement of the histones
Answer: B
Diff: 2 Page Ref: 49

5) Which of the following is *not* true of proteins?
A) They may be denatured or coagulated by heat or acidity.
B) Some types are called enzymes.
C) They appear to be the molecular carriers of the coded hereditary information.
D) Their function depends on the three-dimensional shape.
Answer: C
Diff: 2 Page Ref: 43-49

6) The single most abundant protein in the body is _____.
A) DNA
B) hemoglobin
C) collagen
D) glucose
Answer: C
Diff: 2 Page Ref: 47; Tbl. 2.3

7) Carbohydrates are stored in the liver and muscles in the form of _____.
A) glucose
B) triglycerides
C) glycogen
D) cholesterol
Answer: C
Diff: 2 Page Ref: 40

8) Which of the following describes coenzymes?
A) organic molecules derived from vitamins
B) two enzymes that perform the same function
C) metal ions
D) enzymes that work together
Answer: A
Diff: 2 Page Ref: 47-48

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9) Which of the following is *not* a role of molecular chaperonins?
A) prevent accidental, premature, or incorrect folding of polypeptide chains
B) aid the desired folding and association process of polypeptides
C) help to translocate proteins and certain metal ions across cell membranes
D) promote the breakdown of damaged or denatured proteins
E) act as a biological catalyst
Answer: E
Diff: 2 Page Ref: 46-47

10) A chemical reaction in which bonds are broken is usually associated with _____.
A) the release of energy
B) the consumption of energy
C) a synthesis
D) forming a larger molecule
Answer: A
Diff: 2 Page Ref: 33

11) Salts are always _____.
A) ionic compounds
B) single covalent compounds
C) double covalent compounds
D) hydrogen bonded
Answer: A
Diff: 2 Page Ref: 27-28

12) 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
C) 2
D) 2, 8, 1
Answer: D
Diff: 3 Page Ref: 27

13) A solution that has a pH of 2 could best be described as being _____.
A) acidic
B) basic
C) neutral
D) slightly acidic
Answer: A
Diff: 2 Page Ref: 36

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14) Which of the following is the major positive ion outside cells?
A) nitrogen
B) hydrogen
C) potassium
D) sodium
Answer: D
Diff: 2 Page Ref: 22; Tbl. 2.1

15) Which of the following would be regarded as an organic molecule?
A) H_2O
B) NaCl
C) NaOH
D) CH_4
Answer: D
Diff: 1 Page Ref: 37

16) What is a chain of 25 amino acids called?
A) polypeptide
B) nucleotide
C) protein
D) starch
Answer: A
Diff: 2 Page Ref: 43-46

17) Which of the following constitutes a long chain of simple sugars?
A) monosaccharide
B) polysaccharide
C) protein
D) nucleic acid
Answer: B
Diff: 1 Page Ref: 39-40; Fig. 2.15

18) What level of protein synthesis is represented by the coiling of the protein chain backbone into an alpha helix?
A) primary structure
B) secondary structure
C) tertiary structure
D) quaternary structure
Answer: B
Diff: 1 Page Ref: 45; Fig. 2.19

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19) Carbohydrates and proteins are built up from their basic building blocks by the _____.
A) addition of a water molecule between each two units
B) addition of a carbon atom between each two units
C) removal of a water molecule between each two units
D) removal of a nitrogen atom between each two units
Answer: C
Diff: 2 Page Ref: 37-38

20) Which statement about enzymes is *false*?
A) Enzymes raise the activation energy needed to start a reaction.
B) Enzymes are composed mostly of protein.
C) Enzymes are organic catalysts.
D) Enzymes may be damaged by high temperature.
Answer: A
Diff: 2 Page Ref: 47-49

21) Which of the following statements is false?
A) Chemical reactions proceed more quickly at higher temperatures.
B) Chemical reactions progress at a faster rate when the reacting particles are present in higher numbers.
C) Larger particles move faster than smaller ones and thus collide more frequently and more forcefully.
D) Catalysts increase the rate of chemical reactions.
Answer: C
Diff: 2 Page Ref: 33

22) Which of the following is true regarding the concentration of solutions?
A) Percent solutions are parts per 1000 parts.
B) Molarity is one mole of solute per 1000 ml of solution.
C) To calculate molarity, one must know the atomic number of the solute.
D) To calculate molarity, one must know the atomic weight of the solvent.
Answer: B
Diff: 2 Page Ref: 24-26

23) Select the statement about mixtures that is correct.
A) A solution contains solvent in large amounts and solute in smaller quantities.
B) Solutions contain particles that settle out in time.
C) Suspensions can change reversibly from liquid to solid.
D) Suspensions are homogeneous mixtures of two or more components.
Answer: A
Diff: 2 Page Ref: 24-26

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24) Choose the answer that best describes HCO_3^-.
A) a bicarbonate ion
B) common in the liver
C) a weak acid
D) a proton donor
Answer: A
Diff: 1 Page Ref: 36-37

25) Select which reactions will usually be irreversible regarding chemical equilibrium in living systems.
A) glucose to CO_2 and H_2O
B) ADP + Pi to make ATP
C) H_2O + CO_2 to make H_2CO_3
D) glucose molecules joined to make glycogen
Answer: A
Diff: 3 Page Ref: 33

26) What happens in redox reactions?
A) both decomposition and electron exchange occur
B) the electron acceptor is oxidized
C) the electron donor is reduced
D) the reaction is always easily reversible
Answer: A
Diff: 2 Page Ref: 32

27) Choose the answer that best describes fibrous proteins.
A) rarely exhibit secondary structure
B) are very stable and insoluble in water
C) are usually called enzymes
D) are cellular catalysts
Answer: B
Diff: 2 Page Ref: 46

28) Which of the following does *not* describe the ATP molecule?
A) chemical work
B) mechanical work
C) transport
D) pigments
Answer: D
Diff: 1 Page Ref: 51-52; Fig. 2.24

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29) Select the most correct statement regarding nucleic acids.
A) Three forms exist: DNA, RNA, and tDNA.
B) DNA is a long, double-stranded molecule made up of A, T, G, and C bases.
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.
Answer: B
Diff: 2 Page Ref: 49-51

30) Which of the following is an example of a suspension?
A) cytoplasm
B) salt water
C) rubbing alcohol
D) blood
Answer: D
Diff: 2 Page Ref: 24-25; Fig. 2.4

31) Select the correct statement about isotopes.
A) Isotopes of the same element have the same atomic number but differ in their atomic masses.
B) All the isotopes of an element have the same number of neutrons.
C) All the isotopes of an element are radioactive.
D) Isotopes occur only in the heavier elements.
Answer: A
Diff: 2 Page Ref: 23-24

32) The four elements that make up about 96% of body matter are _____.
A) carbon, oxygen, phosphorus, calcium
B) nitrogen, hydrogen, calcium, sodium
C) carbon, oxygen, hydrogen, nitrogen
D) sodium, potassium, hydrogen, oxygen
Answer: C
Diff: 2 Page Ref: 22; Tbl. 2.1

33) An example of a coenzyme is _____.
A) copper
B) riboflavin (vitamin B_2)
C) iron
D) zinc
Answer: B
Diff: 1 Page Ref: 47-48

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34) _____ is fat soluble, produced in the skin on exposure to UV radiation, and necessary for normal bone growth and function.
A) Vitamin K
B) Cortisol
C) Vitamin A
D) Vitamin D
Answer: D
Diff: 1 Page Ref: 42; Tbl. 2.2

35) In liquid XYZ, you notice that light is scattered as it passes through. There is *no* precipitant in the bottom of the beaker, though it has been sitting for several days. What type of liquid is this?
A) solution
B) suspension
C) colloid
D) mixture
Answer: C
Diff: 3 Page Ref: 26

36) Atom X has 17 protons. How many electrons are in its valence shell?
A) 3
B) 5
C) 7
D) 10
Answer: C
Diff: 3 Page Ref: 26-27

37) Which protein types are vitally important to cell function in all types of stressful circumstances?
A) structural proteins
B) molecular chaperones
C) catalytic proteins
D) regulatory proteins
Answer: B
Diff: 2 Page Ref: 46-47

38) If atom X has an atomic number of 74 it would have which of the following?
A) 37 protons and 37 neutrons
B) 37 electrons
C) 74 protons
D) 37 protons and 37 electrons
Answer: D
Diff: 2 Page Ref: 23

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39) What does the formula $C_6H_{12}O_6$ mean?
A) There are 6 calcium, 12 hydrogen, and 6 oxygen atoms.
B) There are 12 hydrogen, 6 carbon, and 6 oxygen atoms.
C) The molecular weight is 24.
D) The substance is a colloid.
Answer: B
Diff: 2 Page Ref: 31

40) Two good examples of a colloid would be Jell-O® and _____.
A) blood
B) toenails
C) urine
D) cytosol
Answer: D
Diff: 3 Page Ref: 26

41) An atom with a valence of 3 may have a total of _____ electrons.
A) 3
B) 8
C) 13
D) 17
Answer: C
Diff: 3 Page Ref: 27

42) Which of the following is a neutralization reaction?
A) $HCl \rightarrow H^+ + Cl^-$
B) $NaOH \rightarrow Na^+ + OH^-$
C) $NH_3 + H^+ \rightarrow NH_4^{+2}$
D) $HCl + NaOH \rightarrow NaCl + H_2O$
Answer: D
Diff: 2 Page Ref: 36

43) The chemical symbol O□O means _____.
A) zero equals zero
B) both atoms are bonded and have zero electrons in the outer orbit
C) the atoms are double bonded
D) this is an ionic bond with two shared electrons
Answer: C
Diff: 1 Page Ref: 28

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44) What is a dipole?
A) a type of bond
B) a polar molecule
C) a type of reaction
D) an organic molecule
Answer: B
Diff: 2 Page Ref: 30

45) What does CH_4 mean?
A) There is one carbon and four hydrogen atoms.
B) There are four carbon and four hydrogen atoms.
C) This is an inorganic molecule.
D) This was involved in a redox reaction.
Answer: A
Diff: 1 Page Ref: 24

46) Amino acids joining together to make a peptide is a good example of a(n) _____ reaction.
A) synthesis
B) decomposition
C) exchange
D) reversible
Answer: A
Diff: 1 Page Ref: 31

47) Which of the following is *not* considered a factor in influencing a reaction?
A) temperature
B) concentration
C) particle size
D) time
Answer: D
Diff: 2 Page Ref: 33

48) Which of the following is *not* an electrolyte?
A) HCl
B) Ca_2CO_3
C) H_2O
D) NaOH
Answer: C
Diff: 3 Page Ref: 35

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49) Which property of water is demonstrated when we sweat?
A) high heat capacity
B) high heat of vaporization
C) polar solvent properties
D) reactivity
E) cushioning
Answer: B
Diff: 2 Page Ref: 34

50) Sucrose is a _____.
A) monosaccharide
B) disaccharide
C) polysaccharide
D) triglyceride
Answer: B
Diff: 1 Page Ref: 38

51) What is the ratio of fatty acids to glycerol in neutral fats?
A) 1:1
B) 2:1
C) 3:1
D) 4:1
Answer: C
Diff: 1 Page Ref: 40

52) In a DNA molecule, the phosphate serves _____.
A) as a code
B) to hold the molecular backbone together
C) to bind the sugars to their bases
D) as nucleotides
Answer: B
Diff: 1 Page Ref: 50; Fig. 2.22

53) Heat shock proteins (hsp) are a type of protein called _____.
A) coenzymes
B) cofactors
C) eicosanoids
D) chaperones
Answer: D
Diff: 2 Page Ref: 47

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54) Which bonds often bind different parts of a molecule into a specific three-dimensional shape?
A) Carbon
B) Hydrogen
C) Oxygen
D) Amino acid
Answer: B
Diff: 2 Page Ref: 30

2.4 Fill-in-the-Blank/Short Answer Questions

1) The atomic number is equal to the number of _____.
Answer: protons (and electrons)
Diff: 1 Page Ref: 23

2) Molecules such as methane that are made of atoms that share electrons have _____ bonds.
Answer: covalent
Diff: 1 Page Ref: 29; Fig. 2.7

3) An atom with three electrons would have a valence of _____.
Answer: one
Diff: 2 Page Ref: 27-28

4) AB → A + B is an example of a(n) _____ reaction.
Answer: decomposition
Diff: 2 Page Ref: 32

5) _____ have a bitter taste, feel slippery, and are proton acceptors.
Answer: Bases
Diff: 1 Page Ref: 35

6) A holoenzyme is composed of an apoenzyme and a(n) _____.
Answer: cofactor
Diff: 2 Page Ref: 47

7) In a DNA molecule, guanine would connect to _____.
Answer: cytosine
Diff: 1 Page Ref: 49

8) The _____ molecule directly provides energy for cellular work.
Answer: ATP
Diff: 1 Page Ref: 51-52

9) Hydrogen bonds are more like a type of weak _____ than true bonds.
Answer: attraction
Diff: 2 Page Ref: 30

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10) Weak acids and bases make good _____.
Answer: buffers
Diff: 2 Page Ref: 37

11) Starch is the stored carbohydrate in plants, while _____ is the stored carbohydrate in animals.
Answer: glycogen
Diff: 2 Page Ref: 40

12) How many phosphates would AMP have attached to it?
Answer: one
Diff: 2 Page Ref: 51; Fig. 2.23

13) What does the polar end of a phospholipid contain?
Answer: a phosphorus-containing group
Diff: 1 Page Ref: 43

14) What type of chemical bond can form between an element with 11 protons and an element with 17 protons?
Answer: ionic
Diff: 3 Page Ref: 27-28

15) What happens when globular proteins are denatured?
Answer: The active sites are destroyed.
Diff: 3 Page Ref: 46

16) 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.
Diff: 3 Page Ref: 20

17) 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.
Diff: 3 Page Ref: 43

18) What properties does water have that make it a very versatile fluid?
Answer: High heat capacity, high heat of vaporization, polarity and solvent properties, reactivity, and cushioning.
Diff: 3 Page Ref: 34

19) 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.
Diff: 3 Page Ref: 51-52

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20) Explain why chemical reactions in the body are often *irreversible*.
Answer: Chemical reactions that release energy cannot be reversed unless energy is put back into the system. Also, the body may use the chemicals solely for its energy, such as glucose, or some reactions produce molecules in excessive quantities (like CO_2 and NH_4) that the body needs to discard.
Diff: 3 Page Ref: 33

21) When a set of electrodes connected to a lightbulb is placed in a solution of dextrose and a current is applied, the lightbulb 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.
Diff: 3 Page Ref: 35

22) 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.
Diff: 3 Page Ref: 33

23) 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 that hydrogen does not have.
Diff: 3 Page Ref: 23; Fig. 2.2

24) A chemical bond never occurs in 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.
Diff: 3 Page Ref: 24-25

25) 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 $Na + Cl \rightarrow NaCl$ the amount of energy it takes to reverse table salt to chlorine gas and sodium metal is enormous. The reversing of the covalently bonded sugar molecule once it is reduced to ATP molecules is even harder or next to impossible.
Diff: 3 Page Ref: 33

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26) 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.
Diff: 3 Page Ref: 30; Fig. 2.9

27) 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).
Diff: 3 Page Ref: 43

28) Name at least four things you know about enzymes.
Answer:
1. They are proteins.
2. They have specific binding sites for specific substrates.
3. They lower the activation barrier for a specific reaction.
4. The names end in "ase."
5. They can be denatured.
6. They can be used again and again.

Diff: 2 Page Ref: 47-49

29) 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.
Diff: 2 Page Ref: 24

30) 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.
Diff: 3 Page Ref: 33

2.5 Clinical Questions

1) 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.
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2) 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.
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3) 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., tissue, sperm), 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.
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4) 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 reaction to form a water and a salt.
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5) 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.
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6) A 23-year-old male was riding his road bike in 100-degree heat, when he suddenly became nauseated and weak. He called 911 from his cell phone. When the ambulance came, the paramedics started intravenous therapy for severe dehydration. Explain the critical role of water to maintain homeostasis.
Answer: Water is the most abundant and important inorganic compound in living material. It makes up 60% to 80% of the volume of most living cells. The properties of water are: high heat capacity, high heat of vaporization, polar solvent properties, reactivity, and cushioning. In this case the bicyclist lost a large amount of water through perspiration in an effort to cool his body. This caused a disruption in homeostasis.
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7) 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.
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8) A 64-year-old man is admitted to the hospital for nonhealing pressure ulcers to his heels. He has been bedridden for 10 years because of a degenerative muscle disease. Explain why protein would be an important part of his diet to promote wound healing.
Answer: Protein composes 10% to 30% of cell mass and is the basic structural material of the body. Proteins regulate body processes. Skin, hair, and eyes are made of protein, as are the enzymes needed for digestion and absorption. Protein is essential for growth, maintenance, and repair of tissue.
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