Chapter 02 Test Bank

Many traits of organisms, such as body form and color, are controlled by specific proteins, in turn controlled by the DNA genetic sequence of nucleotides. The genetic control of color, as in aphids, does not usually shift during the life of an organism. Researchers found that some specific aphid populations shift from an original red coloration to a green coloration. Genetics could be a factor, if some programmed shift could be identified. Environmental conditions of the living and nonliving habitat could be a factor. Either way, the chemistry and observed changes of pigment molecules in the aphids can be studied with the scientific method.

1. What is the link between colored pigment molecules and other organic molecules?

A. The DNA molecule genetic sequence regulates protein molecule function, which can specifically modify pigment structure that affects color.
B. In the case of the aphids, the pigment molecules of bacteria are genetically passed on to the DNA of infected aphids.
C. This one group of aphids can easily alter the pigment molecule structure by modifying its DNA nucleotide sequence and building new proteins.
D. Pigment molecules are complex, made up of all four of the other organic molecule groups.

2. The initial experiment of Koga and Fugatsu, in testing for any bacterial cause of aphid color change, involved all of these except

A. the specific amounts of red and green pigment molecules were initially measured as dependent variables.

B. a group of aphids infected with *Rickettsiella* bacteria was grown, then killed in order to produce an extract to test on red aphids.

C. a group of green aphids was grown, then killed in order to produce an extract to test on red aphids.

D. a group of red aphids was grown as a control group.

E. a group of red aphids was treated with the independent variable of *Rickettsiella* bacteria infection from green aphids.

3. The observations and research on aphid color changes can most directly be summarized in that

A. Koga and Fugatsu proved that the color change from red to green in aphids was ecologically favorable to survival.

B. species of organisms can be chemically diverse and affect each other, even among similar groups of aphids and bacteria.

C. the method of paper fiber separation of pigment molecules showed that *Ricketsiella* bacteria were the source of the green coloration of aphids.

D. it turned out that the green appearance of aphids was because of the large amount of green *Ricketsiella* bacteria coating their bodies.

4. Researchers noted that only few aphids changed color to green from their original red. This is an unusual observation among any animals. What research question came out of the observations?

A. Will green aphids change their color to red, or remain green as they age?

B. Is the color shift of certain aphids due to genetics or some other factor?

C. The color shift of certain aphids is due to genetics within the species.

D. Do other aphids change colors as they age?

5. A conscientious person habitually reads nutrition labels on food packages for weight watching and general health. The main nutritional molecules are made up of

A. buffers.
B. trace elements.
C. isotopes.
D. bulk elements.

6. In the 1700s, a French scientist, Antoine Lavoisier gained new experimental information about how chemistry works. He isolated chemicals that were reacting, including a metal and an acid. His observation of the results seemed to show that much of the metal had been lost in the chemical reaction. Yet, upon weighing the system, the total amounts of materials had not changed during the reaction. His resulting law of Conservation of Mass also applies to biology, because the materials we are made of are _____ that change forms, but aren't truly lost as we conduct life chemical reactions.

A. isotopes
B. energy
C. solutions
D. matter

7. The unique properties of water, including its strength as a solvent, its three environmental stages of solid, liquid, and gas, and its temperature regulation, are a result of

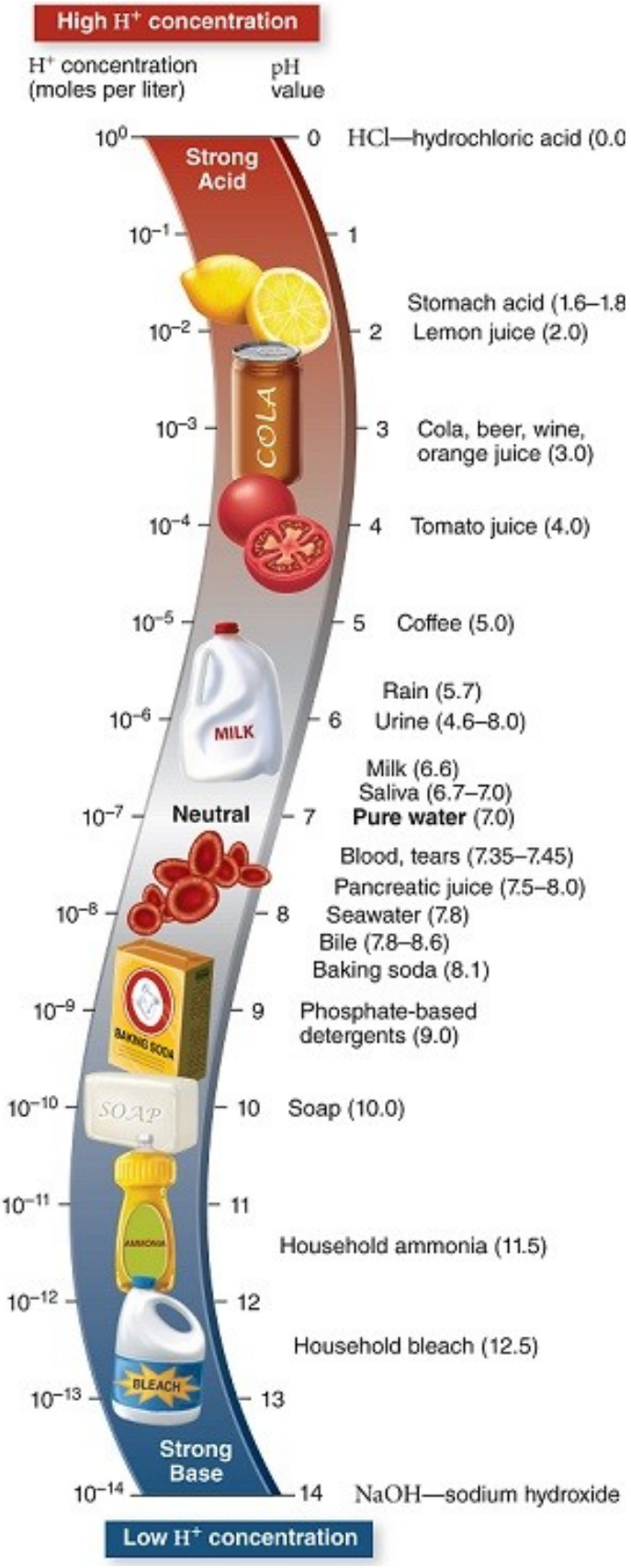
A. symmetric balance of electronegativity as shared electrons orbit equally around the hydrogens and oxygens.

B. the cohesion and adhesion of water molecules that bond more strongly to each other than other substances.

C. unbalanced electronegativity of the hydrogens and oxygens as they share electrons.

D. the imbalance in numbers of electrons around hydrogen and oxygen valence shells after they ionically bond.

Refer to this diagram with common examples of substances and their pH.


High H+ concentration
H+ concentration (moles per liter)
pH value
10^0
0
HCl—hydrochloric acid (0.0
Strong Acid
10^-1
1
Stomach acid (1.6–1.8
10^-2
2
Lemon juice (2.0)
COLA
10^-3
3
Cola, beer, wine, orange juice (3.0)
10^-4
4
Tomato juice (4.0)
10^-5
5
Coffee (5.0)
Rain (5.7)
MILK
10^-6
6
Urine (4.6–8.0)
Milk (6.6)
Saliva (6.7–7.0)
10^-7
Neutral
7
Pure water (7.0)
Blood, tears (7.35–7.45)
Pancreatic juice (7.5–8.0)
10^-8
8
Seawater (7.8)
Bile (7.8–8.6)
Baking soda (8.1)
BAKING SODA
10^-9
9
Phosphate-based detergents (9.0)
SOAP
10^-10
10
Soap (10.0)
10^-11
11
Household ammonia (11.5)
10^-12
12
Household bleach (12.5)
BLEACH
10^-13
13
Strong Base
10^-14
14
NaOH—sodium hydroxide
Low H+ concentration

8. The correct functions of your lungs contribute to the normal pH level of between 7.35 and 7.45. If your lungs do not exchange and remove carbon dioxide from your blood, the blood pH will change. A pH 6.4 reading of your blood indicates

A. a health problem due to the pH value being 10X higher H^+ concentrations than normal in your body.

B. a health problem due to the pH value being 10X higher OH^- concentrations than normal in your body.

C. a health problem due to the pH value being 2X higher OH^- concentrations than normal in your body.

D. no health risk, as part of normal pH changes in your body that in this case bring it closer to neutral pH.

E. a health problem due to the pH value being 2X higher H^+ concentrations than normal in your body.

9.

Our normal blood pH should be in a fairly narrow range. Imagine you sit down to eat a large meal with cola, tomato-based sauce, and a salad with many citrus fruit slices. Identify the one statement that does not apply as one of the likely outcomes of your meal.

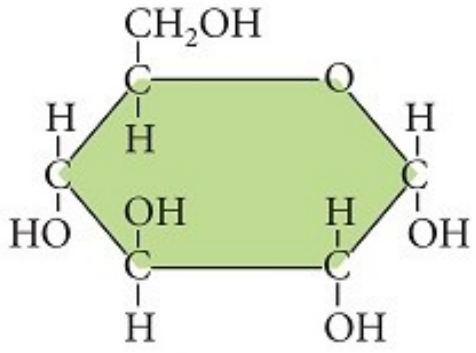
A. The cola, tomato and citrus fruits will add hydrogen (H^+) to your blood and body fluids.

B. Your blood and body fluids will likely become more basic, with higher pH than the normal range.

C. Your body will produce buffer molecules to help neutralize acids you ate, so your blood pH doesn't change much.

D. Your blood and body fluids will likely become more acidic, with lower pH than the normal range.

Examine this image of the glucose molecule.



Glucose
$C_6H_{12}O_6$

10. This glucose molecule is a(an)

A. triglyceride.
B. disaccharide.
C. polymer.
D. carbohydrate.

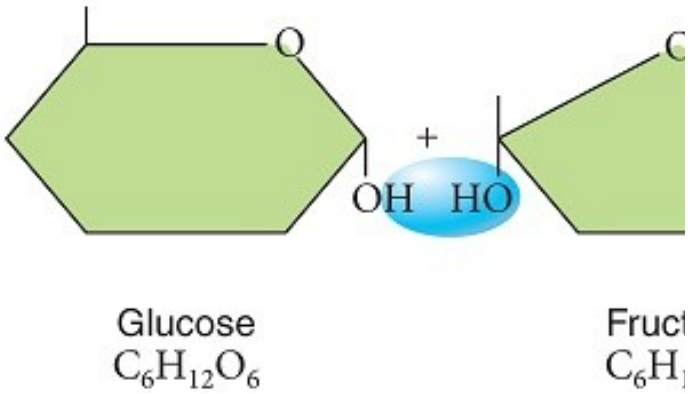
11. In our diets, this molecule is often covalently bonded with others in the polymer form of

A. a complex carbohydrate.
B. a fatty acid chain.
C. a triglyceride.
D. a simple sugar.

12. Compared with a molecule of glucose, this starch molecule does NOT have which characteristic below?

A. This molecule is used by cells for long-term storage and release of energy for cell functions.
B. This molecule is used by cells for quick release of energy for cell functions.
C. This molecule can provide structure for cells that contain it.
D. This molecule is a complex carbohydrate polymer.

Examine these two sugars, as shown prior to the chemical reaction that would bond them.



Glucose
$C_6H_{12}O_6$

Fruct
$C_6H_$

13. These glucose and fructose molecules will bond to form a monosaccharide with the removal of water.

True False

14. The diagram shows glucose and fructose before the chemical reaction called _____ builds a larger polymer from the two monomers.

A. evaporation
B. dehydration synthesis
C. hydrolysis
D. reproduction

15. The ring structure of glucose indicates that it is a(an)

A. disaccharide.
B. fatty acid.
C. monosaccharide.
D. nucleotide.
E. amino acid.

16. The primary elements making up living organisms are

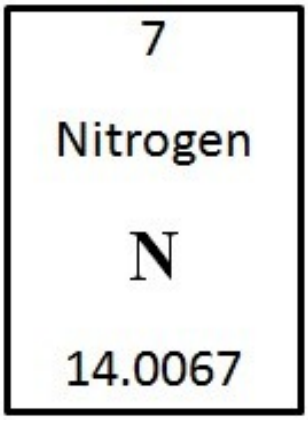
A. carbon, hydrogen, oxygen, sulfur, nitrogen, and phosphorus.
B. carbon, hydrogen, iron, sulfur, sodium, and calcium.
C. carbon, oxygen, iron, chlorine, sulfur, and phosphorus.
D. carbon, hydrogen, oxygen, calcium, iron, and iodine.
E. carbon, oxygen, sulfur, calcium, iron, and phosphorus.

17. The atomic number of an element is the number of

A. protons in the orbitals.
B. neutrons in the orbitals.
C. neutrons in the nucleus.
D. protons in the nucleus.
E. electrons in the nucleus.

18.

Given this information from one element in the periodic table of elements, the number of neutrons and protons is



A. 7, which is the atomic number indicated.
B. 7, which is the atomic mass indicated.
C. 14, which is the atomic number indicated.
D. not discernable, because the number of electrons is also needed.
E. 14, which is the atomic mass indicated.

19.

The mass number is defined as the total number of _____ of an atom.

A. neutrons and electrons
B. protons
C. protons, neutrons, and electrons
D. protons and neutrons
E. protons and electrons

20. An ion is an atom that has

A. a net negative or positive charge, with number of electrons different from number of protons.
B. a net positive charge.
C. the same number of electrons as it does protons.
D. a net negative charge.
E. a different number of neutrons from the number of protons.

21. The first energy shell of an atom contains a maximum of _____ electron(s).

A. one
B. two
C. eight
D. four
E. sixteen

22. An element is found to have atoms with eight electrons in its valence shell. The atoms will be ____

A. highly reactive.
B. not chemically stable.
C. chemically stable.
D. highly likely to combine with other atoms.
E. not inert.

23. In a covalent bond, atoms

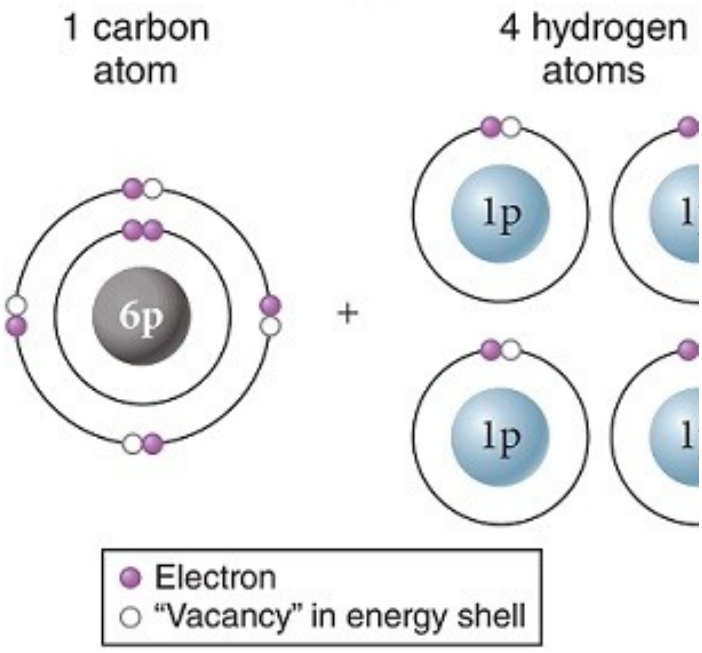
A. share a proton.
B. share electrons.
C. of opposite charges attract each other.
D. both become highly electronegative.

24. In an ionic bond,

A. two atoms both become strongly electronegative and attract each other.
B. atoms attract each other by sharing electrons to fill their valence shells.
C. atoms, having gained or lost electrons, attract one another with opposite charges.
D. two atoms are attracted by partial positive and negative charges.

25.

Carbon and hydrogen make up many biologically important molecules. Carbon has an electronegativity of 2.55 while hydrogen has an electronegativity of 2.0. On the scale of electronegativity from zero (0) to four (4), the carbon and hydrogens shown here have just formed



A. a nonpolar covalent bond.
B. a hydrogen bond.
C. a polar covalent bond.
D. an ionic bond.

26. Which statement summarizes the distinction between nonpolar and polar covalent bonds?

A. The electrons are more evenly and symmetrically distributed in orbit among atoms in a nonpolar covalent bond.

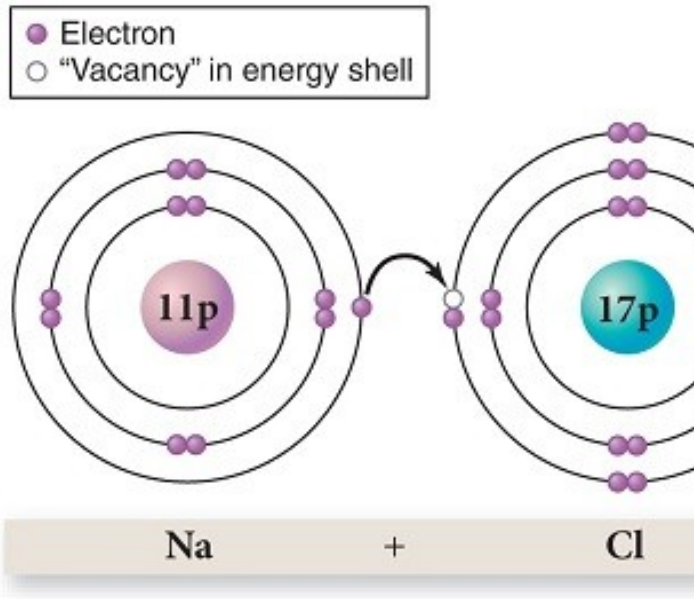
B. Polar covalent bonds are formed when the atoms gain or lose electrons to bond, and become oppositely charged ions.

C. The difference in electronegativity of the atoms in a nonpolar covalent bond is very large.

D. The electrons are more evenly and symmetrically distributed in orbit among atoms in a polar covalent bond.

27.

In the example of ionic bond formation between sodium and chlorine, as shown, which of the following is not a true statement?



A. Sodium donates an electron.

B. The bond that is formed is stronger than a hydrogen bond.

C. Na is the chemical symbol for sodium.

D. Sodium becomes positively charged.

E. Chlorine donates an electron.

28. The chapter concept map links covalent and ionic bonds as chemical bonds that attract atoms or molecules. What is the chemical bond characteristic that contributes to the numerous important properties of water molecules for living organisms?

A.
B.

C.

D.

29.

The property of water demonstrated by this water strider, as it remains on top of the water, is that water is a universal solvent.

True False

30.

You can painlessly wade into a pool, but doing a belly flop off of the high diving board hurts because of

A. water's neutral pH.
B. adhesion in water.
C. cohesion in water.
D. water's high density.
E. water's high boiling point.

31. Trees are able to transport water from the roots to the top branches because

A. cohesion bonds water molecules to each other strongly.

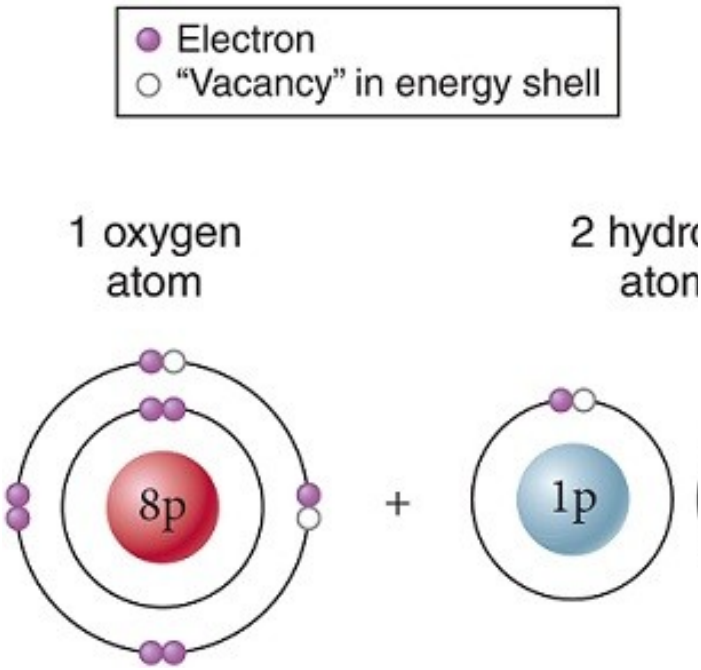
B. adhesion bonds water molecules to the insides of the plant cells.

C. liquid water has a higher density than the air in the plant cells of the roots, trunk and branches.

D. water acts as a solvent of the tree cells as it moves upwards to the branches.

32.

Within a single molecule of water, as shown, ____ bonds are formed between oxygen and hydrogen.



A. hydrophobic
B. hydrogen
C. nuclear
D. ionic
E. covalent

33. If a molecule is added to a glass of water, and is easily dissolved by the water, the added molecule is described as hydrophilic.

True False

34. Evaporation of water is

A.
B.
C.
D.
E.

35. You collect and measure samples of ice and surrounding ice water from a stream in the Winter. You find that you collected the same number of water molecules in each form. Water in the ice (solid) form floats in water of the liquid form because

A. in the ice form, the same number of water molecules are found in a crystal form, yet total larger volume than the liquid water.

B. in the ice form, the same number of water molecules are found in a solid, more compact volume than the liquid water.

C. once the water molecules froze into ice, they became hydrophobic, and started repelling from the liquid.

D. the ice is actively melting, since it was surrounded by the liquid water in the stream where it was collected.

36. In a chemical equation, which components of a chemical reaction is not noted in symbols and abbreviations?

A. Some substance atoms on the left side of the chemical reaction arrow must be destroyed in order to form the substances on the right side.
B. The reactants, or starting substances, are on the left of the chemical reaction arrow.
C. The products, or ending substances, are on the right of the chemical reaction arrow.
D. Reactants and products are on both sides of the yields arrow.
E. The number of atoms of each element must be the same, balanced on each side of the chemical reaction arrow.

37. An acid

A.
B.
C.
D.
E.

38. A base

A. is a chemical that absorbs hydrogen ions from a solution.
B. has a value of 7 on the pH scale.
C. has a value below 7 on the pH scale.
D. is a chemical that adds hydrogen ions to a solution.

39.

Algal phytoplankton are single-celled water organisms that can do photosynthesis like plants. In a lake, summer growth of phytoplankton can change the water pH from pH 7.2 to 6.2. This change indicates all of these except

A. the water at pH 6.2 is a stronger acid solution than before the phytoplankton growth.

B. the water at pH 6.2 has ten times the hydrogen (H^+) concentration as before the phytoplankton growth.

C. the water at pH 6.2 has twice the hydrogen (H^+) concentration as before the phytoplankton growth.

D. the lake water solution changed from slightly basic to slightly acidic in pH.

40.

Organic molecules are defined as chemical compounds that chiefly contain _____ in fairly distinct ratios and structures.

A. carbon and oxygen
B. carbon and nitrogen
C. carbon
D. carbon, hydrogen, and nitrogen
E. carbon and hydrogen

41. The four major groups of organic compounds are

A. carbohydrates, lipids, steroids, and monosaccharides.
B. lipids, fats, waxes, and steroids.
C. carbohydrates, proteins, amino acids, and nucleic acids.
D. carbohydrates, lipids, proteins, and nucleic acids.
E. fats, waxes, carbohydrates, and amino acids.

42. In living cells, a process by which cells break polymers down into monomers by breaking covalent bonds is

A.
B.
C.
D.

43. Examples of monosaccharides are

A.
B.
C.
D.
E.

44. Blood pH is closely maintained at a pH of 7.4. A patient whose blood pH drops below 7.35 is suffering from metabolic acidosis and can go into a coma. What happens to the concentration of H^+ ions in a patient with a blood pH of 6.4?

A. H^+ concentration is increased 2-fold.
B. H^+ concentration is decreased 2-fold.
C. H^+ concentration is increased 10-fold.
D. H^+ concentration is decreased 4-fold.
E. H^+ concentration is decreased 10-fold.

45. Which is not a lipid?

A. a triglyceride
B. a phospholipid
C. a wax
D. a sterol
E. a starch

46. The primary building block (monomer) of proteins is

A. a nucleotide.
B. a fatty acid.
C. a glucose molecule.
D. a group of four interconnected rings.
E. an amino acid.

47. An amino acid contains a structural "backbone" chain of

A. nitrogens and carbons.
B. phosphorus atoms.
C. carbons.
D. nitrogens.
E. carbon and phosphorus atoms.

48. The bond that builds amino acid monomers into protein polymers is

A. a denatured hydrogen bond.
B. an ionic bond also known as a peptide bond.
C. a covalent bond also known as a peptide bond.
D. a primary structural bond.

49. Many diseases, cancers and even normal human variations can be caused by mutations and variations in the DNA nucleotide sequence. The most likely immediate result of DNA having a different nucleotide sequence is that

A. the peptide bonds in the protein would by hydrolyzed and the protein would fall apart.
B. the protein resulting from the DNA mutation would be denatured and nonfunctional.
C. the primary structure of R group sequence in a protein would be altered.
D. no direct result of change in the protein molecule would occur if DNA is mutated.

50. The primary building block (monomer) of nucleic acids is

A. a glucose molecule.
B. a fatty acid.
C. a nucleotide.
D. an amino acid.
E. a group of four interconnected rings.

51. The three major components in a nucleotide are

A. a nitrogen base, a five-carbon sugar, and a phosphate group.
B. a carboxyl group, an R group, and an amino group.
C. glucose, a nitrogen base, and a phosphate group.
D. a nitrogen base, a six-carbon sugar, and a phosphate group.
E. glucose, a fatty acid, and glycerol.

52. The comparison listed below that is not true in distinguishing DNA from RNA is that

A. DNA has a main function of storing our genetic code, while RNA is used in units to build specific proteins in a cell.
B. DNA is a long two-sided molecule while RNA is a shorter single-sided molecule.
C. DNA and RNA share all nucleotides, except that RNA has Uracil instead of Thymine.
D. DNA is a molecule that stores and regulates our genetics, while RNA is used for cellular energy storage and release for biological functions.

53. The four nitrogen bases found in RNA are

A.
B.
C.
D.
E.

54. Sugars $(CH_2O)_n$ dissolve well in water because sugars form ____ bonds with water.

A. hydrophobic
B. hydrogen
C. non-polar
D. ionic
E. covalent

55. ____ bonds are formed between monomers to form a polymer.

A. Hydrogen
B. Covalent
C. Nuclear
D. Hydrophobic
E. Ionic

56. Saturated fats have long straight tails of fatty acids, and can pack or clump tightly together in cells and animal bodies. Unsaturated fats have kinks in their tails due to double bonds, which prevents them from packing together as tightly. Animals that are ectothermic (their body temperature fluctuates with the environment) need to keep their membranes fluid at cooler temperature and thus use _____ in their membranes.

A.
B.
C.
D.
E.

57. Saturated fats have long straight tails of fatty acids, while unsaturated fats from vegetables have kinks in their tails due to double bonds. These kinks prevent the fats from packing together as tightly. Hydrogenated vegetable oils, or trans fats, have hydrogens added back to the double bonds and thus behave like

A. carbohydrates.
B. waxes.
C. unsaturated fats.
D. saturated fats.
E. proteins.

58. The group of organic molecule polymers with the most complex and diverse three-dimensional structure are

A. unsaturated fats.
B. proteins.
C. carbohydrates.
D. waxes.
E. saturated fats.

59. Cohesion is a property of water in which water molecules tend to stick together.

True False

60. A peptide bond is a covalent bond formed between the amino group of one amino acid and the R group of another amino acid.

True False

61. A substance in which other substances dissolve is called a solute.

True False

62. Our general economic source of unsaturated fatty acids is from plants, and composed of at least one pair of double-bonded carbons.

True False

63. Of the 20 common amino acids in all organisms, essential amino acids are those we must consume in food.

True False

64. Among numerous functions of common proteins, which of these pairs does not correctly match a protein with its function?

A. DNA polymerase helps synthesize new DNA before our cells divide.
B. Antibodies regulate sweat to keep infections out of our skin pores.
C. Collagen is a structural protein to support hair, skin, and nails.
D. Insulin regulates blood glucose levels.
E. Hemoglobin protein transports oxygen to our cells.

65. If a protein is denatured, its structure has been changed enough to make the protein nonfunctional.

True False

66. Proteins store the genetic information of the cell and transmit it to the next generation.

True False

67. If a carbohydrate polymer is limited to two monomer units, such as sucrose made from glucose and fructose, it is called

A. an oligosaccharide.
B. a disaccharide.
C. a polysaccharide.
D. a monosaccharide.

68.

Having the typical ratio of carbon, hydrogen, and oxygen of carbohydrates, the chemical formula for glucose is

A. $C_{12}H_{22}O_{11}$.
B. $C_6H_6O_{12}$.
C. $C_6H_{12}O_6$.
D. $C_{12}H_6O_{12}$.
E. $C_6H_6O_6$.

Chapter 02 Test Bank Key

Many traits of organisms, such as body form and color, are controlled by specific proteins, in turn controlled by the DNA genetic sequence of nucleotides. The genetic control of color, as in aphids, does not usually shift during the life of an organism. Researchers found that some specific aphid populations shift from an original red coloration to a green coloration. Genetics could be a factor, if some programmed shift could be identified. Environmental conditions of the living and nonliving habitat could be a factor. Either way, the chemistry and observed changes of pigment molecules in the aphids can be studied with the scientific method.

1. What is the link between colored pigment molecules and other organic molecules?

A. The DNA molecule genetic sequence regulates protein molecule function, which can specifically modify pigment structure that affects color.

B.

C.

D.

Blooms Level: 4. Analyze
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Learning Outcome: 02.06.01 Explain how researchers determined that bacteria induce green pigment production in aphids.
Section: 02.05
Section: 02.06
Topic: Nucleic Acids
Type: Integrative
Type: Investigating Life

2. The initial experiment of Koga and Fugatsu, in testing for any bacterial cause of aphid color change, involved all of these except

A. the specific amounts of red and green pigment molecules were initially measured as dependent variables.

B.

C.

D.

E.

Blooms Level: 3. Apply
Learning Outcome: 02.06.01 Explain how researchers determined that bacteria induce green pigment production in aphids.
Section: 02.06
Topic: Chemical Bonds
Topic: Nucleic Acids
Type: Investigating Life

3. The observations and research on aphid color changes can most directly be summarized in that

A.

B. species of organisms can be chemically diverse and affect each other, even among similar groups of aphids and bacteria.

C.

D.

Blooms Level: 4. Analyze
Learning Outcome: 02.06.01 Explain how researchers determined that bacteria induce green pigment production in aphids.
Section: 02.06
Topic: Chemical Bonds
Topic: Nucleic Acids
Type: Investigating Life

4. Researchers noted that only few aphids changed color to green from their original red. This is an unusual observation among any animals. What research question came out of the observations?

A.
B. Is the color shift of certain aphids due to genetics or some other factor?
C.
D.

Blooms Level: 2. Understand
Learning Outcome: 02.06.01 Explain how researchers determined that bacteria induce green pigment production in aphids.
Section: 02.06
Topic: Nucleic Acids
Type: Investigating Life

5. A conscientious person habitually reads nutrition labels on food packages for weight watching and general health. The main nutritional molecules are made up of

A.
B.
C.
D. bulk elements.

Blooms Level: 2. Understand
Learning Outcome: 02.01.01 Identify the most abundant essential elements in living organisms.
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.01
Section: 02.05
Topic: Carbohydrate
Topic: Lipids
Topic: Nucleic Acids
Topic: Proteins
Type: Integrative

6. In the 1700s, a French scientist, Antoine Lavoisier gained new experimental information about how chemistry works. He isolated chemicals that were reacting, including a metal and an acid. His observation of the results seemed to show that much of the metal had been lost in the chemical reaction. Yet, upon weighing the system, the total amounts of materials had not changed during the reaction. His resulting law of Conservation of Mass also applies to biology, because the materials we are made of are _____ that change forms, but aren't truly lost as we conduct life chemical reactions.

A.
B.
C.
D. matter

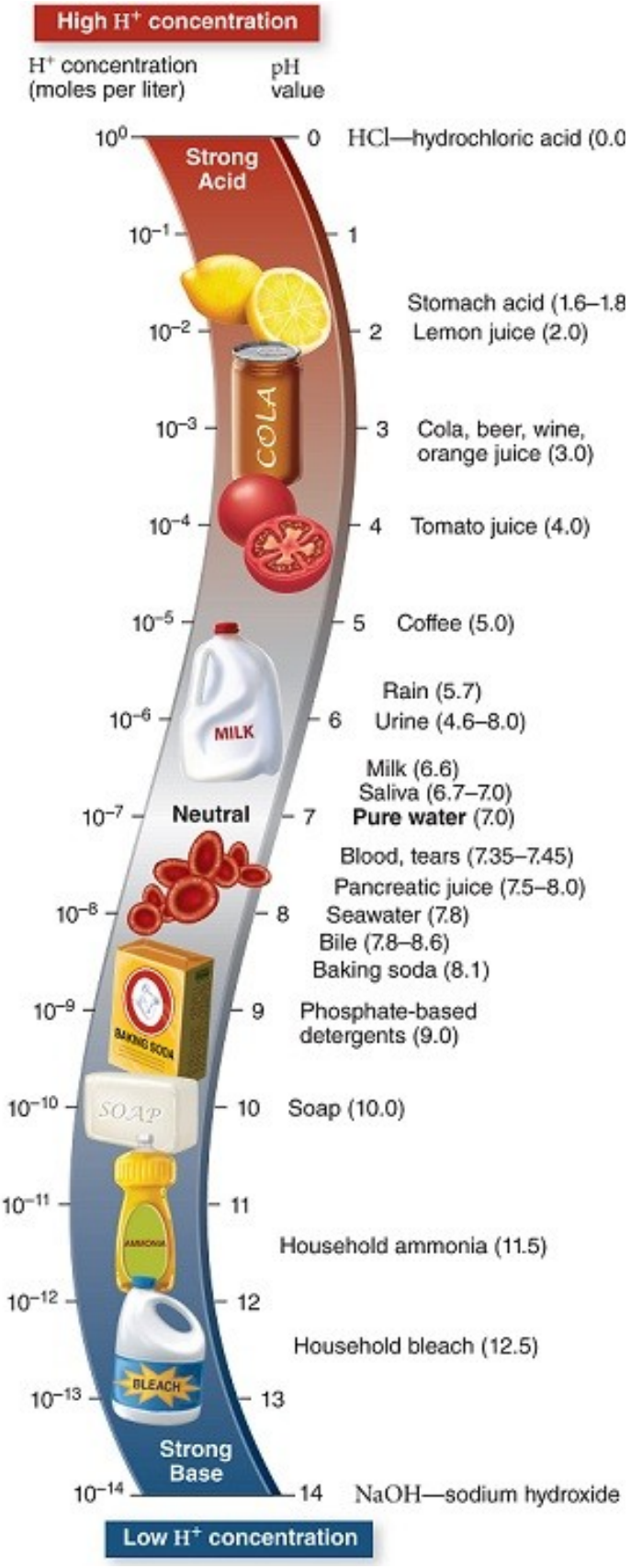
Blooms Level: 2. Understand
Learning Outcome: 02.00.01 Explain the relationship between chemistry and biology.
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Section: 02.01
Topic: Atomic Structure
Type: Integrative

7. The unique properties of water, including its strength as a solvent, its three environmental stages of solid, liquid, and gas, and its temperature regulation, are a result of

A.
B.
C. unbalanced electronegativity of the hydrogens and oxygens as they share electrons.
D.

Blooms Level: 2. Understand
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.02.04 Explain the relationship between electronegativity and chemical bond formation.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.02
Section: 02.03
Topic: Properties of Water
Type: Integrative

Refer to this diagram with common examples of substances and their pH.


High H+ concentration
H+ concentration (moles per liter)
pH value
10^0
0
HCl—hydrochloric acid (0.0
Strong Acid
10^-1
1
Stomach acid (1.6–1.8
10^-2
2
Lemon juice (2.0)
COLA
10^-3
3
Cola, beer, wine, orange juice (3.0)
10^-4
4
Tomato juice (4.0)
10^-5
5
Coffee (5.0)
Rain (5.7)
MILK
10^-6
6
Urine (4.6–8.0)
Milk (6.6)
Saliva (6.7–7.0)
10^-7
Neutral
7
Pure water (7.0)
Blood, tears (7.35–7.45)
Pancreatic juice (7.5–8.0)
10^-8
8
Seawater (7.8)
Bile (7.8–8.6)
Baking soda (8.1)
BAKING SODA
10^-9
9
Phosphate-based detergents (9.0)
SOAP
10^-10
10
Soap (10.0)
10^-11
11
Household ammonia (11.5)
10^-12
12
Household bleach (12.5)
BLEACH
10^-13
13
Strong Base
10^-14
14
NaOH—sodium hydroxide
Low H+ concentration

8. The correct functions of your lungs contribute to the normal pH level of between 7.35 and 7.45. If your lungs do not exchange and remove carbon dioxide from your blood, the blood pH will change. A pH 6.4 reading of your blood indicates

A. a health problem due to the pH value being 10X higher H^+ concentrations than normal in your body.

B.

C.

D.

E.

Blooms Level: 3. Apply
Figure: 02.14
Learning Outcome: 02.04.01 Explain how acids and bases affect pH.
Section: 02.04
Topic: Acids and Bases
Topic: Properties of Water

9. Our normal blood pH should be in a fairly narrow range. Imagine you sit down to eat a large meal with cola, tomato-based sauce, and a salad with many citrus fruit slices. Identify the one statement that does not apply as one of the likely outcomes of your meal.

A.

B. Your blood and body fluids will likely become more basic, with higher pH than the normal range.

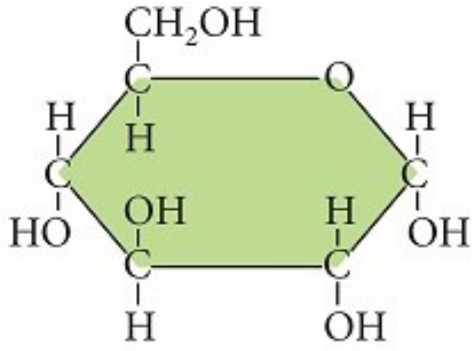
C.

D.

Blooms Level: 3. Apply
Figure: 02.14
Learning Outcome: 02.00.01 Explain the relationship between chemistry and biology.
Learning Outcome: 02.04.01 Explain how acids and bases affect pH.
Section: 02.04
Topic: Acids and Bases
Topic: Properties of Water

Type: Integrative

Examine this image of the glucose molecule.



Glucose
$C_6H_{12}O_6$

10.

This glucose molecule is a(an)

A.
B.
C.
D. carbohydrate.

Blooms Level: 1. Remember
Figure: 02.17
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

11.

In our diets, this molecule is often covalently bonded with others in the polymer form of

A. a complex carbohydrate.
B.
C.
D.

Blooms Level: 2. Understand
Figure: 02.17
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

12. Compared with a molecule of glucose, this starch molecule does NOT have which characteristic below?

A.

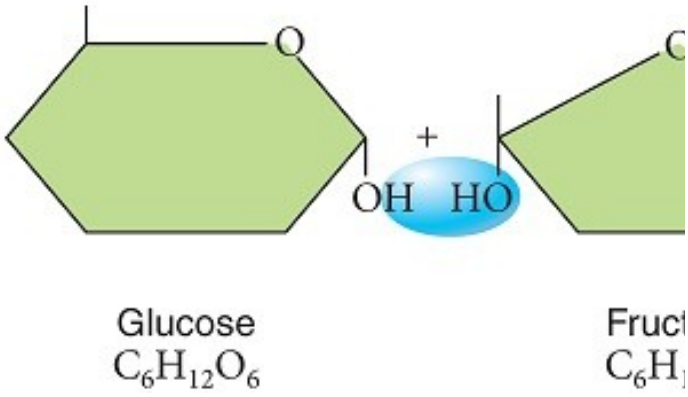
B. This molecule is used by cells for quick release of energy for cell functions.

C.

D.

Blooms Level: 2. Understand
Figure: 02.17
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

Examine these two sugars, as shown prior to the chemical reaction that would bond them.



13. These glucose and fructose molecules will bond to form a monosaccharide with the removal of water.

FALSE

Formation of new covalent bonds between monomers results in larger, multiple unit molecules. Read section 2.5 for more information.

Blooms Level: 1. Remember
Figure: 02.17
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

14. The diagram shows glucose and fructose before the chemical reaction called _____ builds a larger polymer from the two monomers.

A.
B. dehydration synthesis
C.
D.

Blooms Level: 2. Understand
Figure: 02.17
Learning Outcome: 02.05.01 Differentiate between dehydration synthesis and hydrolysis.
Section: 02.05
Topic: Carbohydrate
Topic: Chemical Bonds

15. The ring structure of glucose indicates that it is a(an)

A.
B.
C. monosaccharide.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate
Topic: Chemical Bonds

16. The primary elements making up living organisms are

A. carbon, hydrogen, oxygen, sulfur, nitrogen, and phosphorus.

B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.01.01 Identify the most abundant essential elements in living organisms.
Section: 02.01
Topic: Atomic Structure

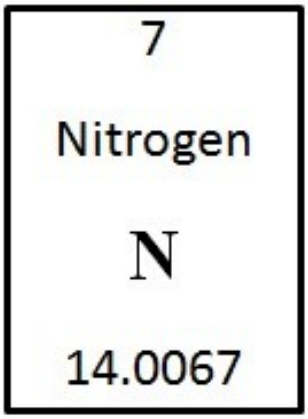
17. The atomic number of an element is the number of

A.
B.
C.
D. protons in the nucleus.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.01.02 Describe the structure of atoms.
Section: 02.01
Topic: Atomic Structure

18.

Given this information from one element in the periodic table of elements, the number of neutrons and protons is



A.
B.
C.
D.
E. 14, which is the atomic mass indicated.

Blooms Level: 3. Apply
Learning Outcome: 02.01.02 Describe the structure of atoms.
Section: 02.01
Topic: Atomic Structure

19.

The mass number is defined as the total number of _____ of an atom.

A.
B.
C.
D. protons and neutrons
E.

Blooms Level: 1. Remember
Learning Outcome: 02.01.02 Describe the structure of atoms.
Section: 02.01
Topic: Atomic Structure

20. An ion is an atom that has

A. a net negative or positive charge, with number of electrons different from number of protons.

B.
C.
D.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.01.01 Identify the most abundant essential elements in living organisms.
Section: 02.01
Topic: Atomic Structure

21. The first energy shell of an atom contains a maximum of _____ electron(s).

A.
B. two
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.02.02 Use the number of valence electrons in an atom to predict the number of bonds it will form.
Section: 02.02
Topic: Atomic Structure

22. An element is found to have atoms with eight electrons in its valence shell. The atoms will be ____

A.
B.
C. chemically stable.
D.
E.

Blooms Level: 3. Apply
Learning Outcome: 02.01.02 Describe the structure of atoms.
Learning Outcome: 02.02.02 Use the number of valence electrons in an atom to predict the number of bonds it will form.
Section: 02.01
Section: 02.02
Topic: Atomic Structure
Type: Integrative

23. In a covalent bond, atoms

A.
B. share electrons.
C.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Section: 02.02
Topic: Chemical Bonds

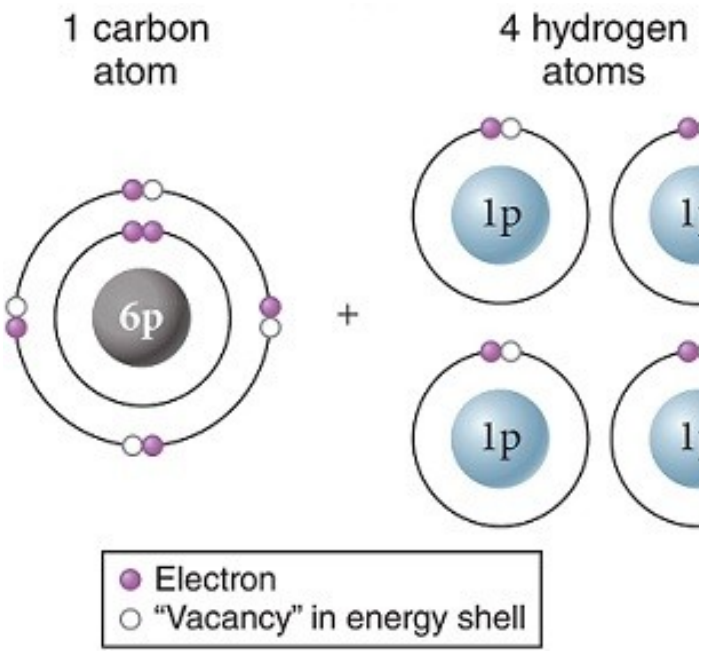
24. In an ionic bond,

A.
B.
C. atoms, having gained or lost electrons, attract one another with opposite charges.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Section: 02.02
Topic: Chemical Bonds

25.

Carbon and hydrogen make up many biologically important molecules. Carbon has an electronegativity of 2.55 while hydrogen has an electronegativity of 2.0. On the scale of electronegativity from zero (0) to four (4), the carbon and hydrogens shown here have just formed



A. a nonpolar covalent bond.

B.

C.

D.

Blooms Level: 4. Analyze
Figure: 02.07
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.02.04 Explain the relationship between electronegativity and chemical bond formation.
Section: 02.02
Topic: Chemical Bonds
Type: Integrative

26. Which statement summarizes the distinction between nonpolar and polar covalent bonds?

A. The electrons are more evenly and symmetrically distributed in orbit among atoms in a nonpolar covalent bond.

B.

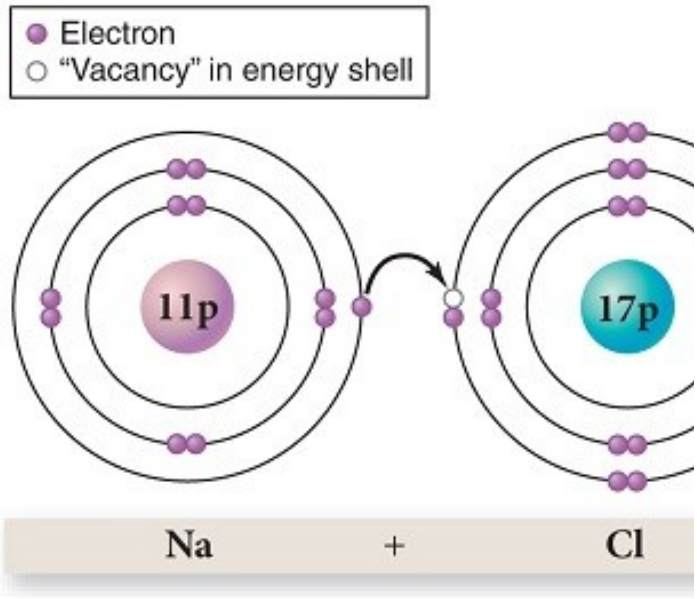
C.

D.

Blooms Level: 2. Understand
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.02.04 Explain the relationship between electronegativity and chemical bond formation.
Section: 02.02
Topic: Chemical Bonds

27.

In the example of ionic bond formation between sodium and chlorine, as shown, which of the following is not a true statement?



A.
B.
C.
D.
E. Chlorine donates an electron.

Blooms Level: 1. Remember
Figure: 02.06
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Section: 02.02
Topic: Chemical Bonds

28. The chapter concept map links covalent and ionic bonds as chemical bonds that attract atoms or molecules. What is the chemical bond characteristic that contributes to the numerous important properties of water molecules for living organisms?

A.
B.

C.

D.

Blooms Level: 2. Understand
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.02
Section: 02.03
Topic: Chemical Bonds
Type: Integrative

29.

The property of water demonstrated by this water strider, as it remains on top of the water, is that water is a universal solvent.

FALSE

Water's partial charges allow it to be cohesive, so that the surface tension among molecules can support this light insect. Read section 2.3.A for more information.

Blooms Level: 1. Remember
Figure: 02.10
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.03
Topic: Chemical Bonds

30. You can painlessly wade into a pool, but doing a belly flop off of the high diving board hurts because of

A.
B.
C. cohesion in water.
D.
E.

Blooms Level: 3. Apply
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.02
Section: 02.03
Topic: Chemical Bonds
Topic: Properties of Water
Type: Integrative

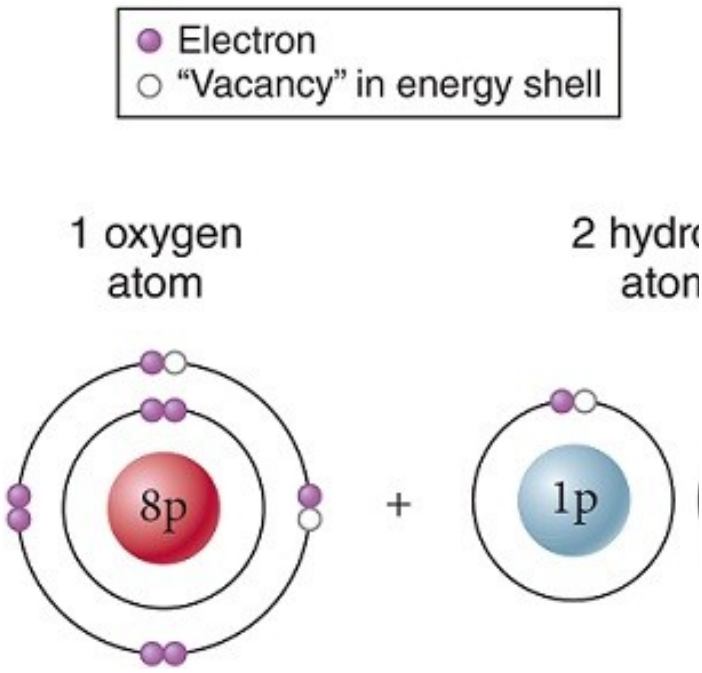
31. Trees are able to transport water from the roots to the top branches because

A.
B. adhesion bonds water molecules to the insides of the plant cells.
C.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.03
Topic: Chemical Bonds
Topic: Properties of Water

32.

Within a single molecule of water, as shown, ____ bonds are formed between oxygen and hydrogen.



A.
B.
C.
D.
E. covalent

Blooms Level: 1. Remember
Figure: 02.07
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Section: 02.02
Topic: Atomic Structure
Topic: Chemical Bonds
Topic: Properties of Water

33. If a molecule is added to a glass of water, and is easily dissolved by the water, the added molecule is described as hydrophilic.

TRUE

In understanding water's function as a solvent, hydrophilic molecules are paired with polar molecules that can be dissolved easily by the polar
water molecule. Read section 2.3.B for more information.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.02
Section: 02.03
Topic: Properties of Water
Type: Integrative

34. Evaporation of water is

A.
B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.03
Topic: Properties of Water

35. You collect and measure samples of ice and surrounding ice water from a stream in the Winter. You find that you collected the same number of water molecules in each form. Water in the ice (solid) form floats in water of the liquid form because

A. in the ice form, the same number of water molecules are found in a crystal form, yet total larger volume than the liquid water.
B.
C.
D.

Blooms Level: 2. Understand
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.03

Topic: Properties of Water

36. In a chemical equation, which components of a chemical reaction is not noted in symbols and abbreviations?

A. Some substance atoms on the left side of the chemical reaction arrow must be destroyed in order to form the substances on the right side.

B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.03
Topic: Chemical Reactions

37. An acid

A.
B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.04.01 Explain how acids and bases affect pH.
Section: 02.04
Topic: Acids and Bases

38. A base

A. is a chemical that absorbs hydrogen ions from a solution.

B.
C.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.04.01 Explain how acids and bases affect pH.
Section: 02.04
Topic: Acids and Bases

39.

Algal phytoplankton are single-celled water organisms that can do photosynthesis like plants. In a lake, summer growth of phytoplankton can change the water pH from pH 7.2 to 6.2. This change indicates all of these except

A.
B.

C. the water at pH 6.2 has twice the hydrogen (H^+) concentration as before the phytoplankton growth.

D.

Blooms Level: 2. Understand
Learning Outcome: 02.04.01 Explain how acids and bases affect pH.
Section: 02.04
Topic: Acids and Bases

40.

Organic molecules are defined as chemical compounds that chiefly contain _____ in fairly distinct ratios and structures.

A.
B.
C.
D.
E. carbon and hydrogen

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate
Topic: Chemical Bonds
Topic: Lipids
Topic: Nucleic Acids
Topic: Proteins

41. The four major groups of organic compounds are

A.
B.
C.
D. carbohydrates, lipids, proteins, and nucleic acids.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate
Topic: Lipids
Topic: Nucleic Acids
Topic: Proteins

42. In living cells, a process by which cells break polymers down into monomers by breaking covalent bonds is

A.
B.
C.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.05.01 Differentiate between dehydration synthesis and hydrolysis.
Section: 02.05
Topic: Chemical Bonds
Topic: Chemical Reactions

43. Examples of monosaccharides are

A.
B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

44. Blood pH is closely maintained at a pH of 7.4. A patient whose blood pH drops below 7.35 is suffering from metabolic acidosis and can go into a coma. What happens to the concentration of H^+ ions in a patient with a blood pH of 6.4?

A.
B.
C. H^+ concentration is increased 10-fold.
D.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.04.01 Explain how acids and bases affect pH.
Section: 02.04
Topic: Acids and Bases

45. Which is not a lipid?

A.
B.
C.
D.
E. a starch

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Lipids

46. The primary building block (monomer) of proteins is

A.
B.
C.
D.
E. an amino acid.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Proteins

47. An amino acid contains a structural "backbone" chain of

A. nitrogens and carbons.
B.
C.
D.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Proteins

48. The bond that builds amino acid monomers into protein polymers is

A.
B.
C. a covalent bond also known as a peptide bond.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Bonds
Topic: Proteins

49. Many diseases, cancers and even normal human variations can be caused by mutations and variations in the DNA nucleotide sequence. The most likely immediate result of DNA having a different nucleotide sequence is that

A.
B.
C. the primary structure of R group sequence in a protein would be altered.
D.

Blooms Level: 3. Apply
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Nucleic Acids
Topic: Proteins
Type: Integrative

50. The primary building block (monomer) of nucleic acids is

A.
B.
C. a nucleotide.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Nucleic Acids

51. The three major components in a nucleotide are

A. a nitrogen base, a five-carbon sugar, and a phosphate group.
B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Nucleic Acids

52. The comparison listed below that is not true in distinguishing DNA from RNA is that

A.
B.
C.
D. DNA is a molecule that stores and regulates our genetics, while RNA is used for cellular energy storage and release for biological functions.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Nucleic Acids

53. The four nitrogen bases found in RNA are

A.
B.
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Nucleic Acids

54. Sugars $(CH_2O)_n$ dissolve well in water because sugars form ____ bonds with water.

A.
B. hydrogen
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.02
Section: 02.03
Topic: Chemical Bonds
Type: Integrative

55. ____ bonds are formed between monomers to form a polymer.

A.
B. Covalent
C.
D.
E.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.02
Section: 02.05
Topic: Chemical Bonds

56. Saturated fats have long straight tails of fatty acids, and can pack or clump tightly together in cells and animal bodies. Unsaturated fats have kinks in their tails due to double bonds, which prevents them from packing together as tightly. Animals that are ectothermic (their body temperature fluctuates with the environment) need to keep their membranes fluid at cooler temperature and thus use _____ in their membranes.

A.
B.
C.
D.
E.

Blooms Level: 3. Apply
Learning Outcome: 02.00.01 Explain the relationship between chemistry and biology.
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Bonds
Topic: Lipids
Type: Integrative

57. Saturated fats have long straight tails of fatty acids, while unsaturated fats from vegetables have kinks in their tails due to double bonds. These kinks prevent the fats from packing together as tightly. Hydrogenated vegetable oils, or trans fats, have hydrogens added back to the double bonds and thus behave like

A.
B.
C.
D. saturated fats.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Bonds
Topic: Lipids

58. The group of organic molecule polymers with the most complex and diverse three-dimensional structure are

A.
B. proteins.
C.
D.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Bonds
Topic: Proteins

59. Cohesion is a property of water in which water molecules tend to stick together.

TRUE

Cohesion occurs when molecules of any substance attract other molecules of the same substance, and water does this with hydrogen bonds. Read sections 2.2.D and 2.3 for more information.

Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Compare and contrast ionic, covalent, and hydrogen bonds.
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.02
Section: 02.03
Topic: Chemical Bonds
Topic: Properties of Water

60. A peptide bond is a covalent bond formed between the amino group of one amino acid and the R group of another amino acid.

FALSE

Locations of peptide bonds is not random in building the polymers, but must be located in specific positions. Read section 2.5.C for more information.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Bonds
Topic: Proteins

61. A substance in which other substances dissolve is called a solute.

FALSE

Liquid solutions, such as our blood plasma rely on the solvent and solute components to be balanced for our health. Read section 2.3.B for more information.

Blooms Level: 1. Remember
Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.
Section: 02.03
Topic: Chemical Bonds
Topic: Properties of Water

62. Our general economic source of unsaturated fatty acids is from plants, and composed of at least one pair of double-bonded carbons.

TRUE

The economic understanding of food sources we buy can be important as you note differences among the natural and modified fatty acids. Read section 2.5.B for more information.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Bonds
Topic: Lipids

63. Of the 20 common amino acids in all organisms, essential amino acids are those we must consume in food.

TRUE

There are eight amino acids that humans gain from protein-rich foods. Read section 2.5.C for more information.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Proteins

64. Among numerous functions of common proteins, which of these pairs does not correctly match a protein with its function?

A.
B. Antibodies regulate sweat to keep infections out of our skin pores.
C.
D.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Chemical Reactions
Topic: Proteins

65. If a protein is denatured, its structure has been changed enough to make the protein nonfunctional.

TRUE

Normal functions of proteins cease if the 3-dimensional structure is changed by various conditions. Read section 2.5.C for more information.

Blooms Level: 1. Remember
Learning Outcome: 02.05.01 Differentiate between dehydration synthesis and hydrolysis.
Section: 02.05
Topic: Proteins

66. Proteins store the genetic information of the cell and transmit it to the next generation.

FALSE

Although proteins have many functions, and have structure determined by the DNA genetic code, protein functions do not include storage and inheritance of genetics. Read section 2.5.C for more information.

Blooms Level: 2. Understand
Learning Outcome: 02.05.01 Differentiate between dehydration synthesis and hydrolysis.
Section: 02.05
Topic: Proteins

67. If a carbohydrate polymer is limited to two monomer units, such as sucrose made from glucose and fructose, it is called

A.
B. a disaccharide.
C.
D.

Blooms Level: 1. Remember
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

68. Having the typical ratio of carbon, hydrogen, and oxygen of carbohydrates, the chemical formula for glucose is

A.
B.
C. $C_6H_{12}O_6$.
D.
E.

Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four main classes of organic molecules.
Section: 02.05
Topic: Carbohydrate

Chapter 02 Test Bank Summary