

Chemical Bonds

- Which of the following is NOT a true compound?
 - pure substance
 - composed of combinations of atoms
 - held together by chemical bonds
 - substance that cannot be broken down into simpler units
- The smallest unit of an element that can exist alone or in combination with other elements is a(an)
 - nucleus
 - atom
 - molecule
 - proton
- The smallest particle of a compound or a gaseous element that can exist and still retain the characteristic properties of that substance is a (an)
 - Molecule
 - Element
 - Atom
 - Electron
- What determines the chemical properties of an atom?
 - Valence electrons
 - Atomic weight
 - Neutrons and protons
 - Protons only
- “Atoms attempt to acquire an outer orbital with eight electrons” is a statement of the
 - Heisenburg uncertainty theory
 - Atomic theory
 - Octet rule
 - Chemical energy balancing rule
- Atoms that achieve an octet by sharing electrons form
 - Covalent bonds
 - Ionic bonds
 - Metallic bonds
 - Hydrogen bonds
- The electrostatic attraction between positive and negative ions is called a (an)
 - Ionic bond
 - Metallic bond
 - Covalent bond
 - Electrostatic bond
- The energy released during the formation of an ionic bond is
 - Ionic energy
 - Heat of formation
 - Activation energy
 - Heat of creation

9. What kind of bond has unequal sharing of bonding electrons?
 - a. Polar covalent
 - b. Covalent
 - c. Ionic
 - d. Polar ionic
10. Pure substances that cannot be broken down into anything simpler are
 - a. Elements
 - b. Compounds
 - c. Molecules
 - d. Mixtures
11. An ion can be described as an element or compound that
 - a. Gains electrons
 - b. Loses electrons
 - c. Gains or loses electrons
 - d. Shares electrons
12. You know that a chemical reaction is taking place if
 - a. The temperature of a substance increases
 - b. Electrons move in a steady current
 - c. Chemical bonds are formed or broken
 - d. All of the above
13. The electrons that participate in chemical bonding are the
 - a. Valence electrons
 - b. Electrons in fully occupied orbitals
 - c. Stable inner electrons
 - d. All of the above
14. Which type of chemical bond is formed by a transfer of electrons?
 - a. Ionic
 - b. Covalent
 - c. Metallic
 - d. Hydrogen
15. Which type of chemical bond is formed between two atoms by the sharing of electrons?
 - a. Ionic
 - b. Covalent
 - c. Metallic
 - d. Hydrogen
16. What type of compounds are salts, such as sodium chloride?
 - a. Ionic compounds
 - b. Covalent compounds
 - c. Polar compounds
 - d. Metallic compounds
17. Which combination of elements forms crystalline solids that will dissolve in water, producing a solution of ions that can conduct an electric current?
 - a. Metal and metal
 - b. Metal and non-metal
 - c. Non-metal and non-metal
 - d. All of the above

18. In a single covalent bond between two atoms, a
- Single electron from one of the atoms is shared
 - Pair of electrons from one of the atoms is shared
 - Pair of electrons, one from each atom, is shared
 - Single electrons is transferred from one atom
19. A covalent bond in which there is an unequal sharing of bonding electrons is a
- Single covalent bond
 - Double covalent bond
 - Triple covalent bond
 - Polar covalent bond
20. An inorganic compound made of only two different elements has a systematic name that always ends with the suffix
- ite
 - ate
 - ide
 - ous
21. Dihydrogen monoxide is the systematic name for a compound that has the common name of
- Laughing gas
 - Water
 - Smog
 - Rocket fuel
22. Which of the following is not an example of a chemical reaction?
- Blending of a vanilla milkshake
 - Growing tomatoes
 - Burning logs in a fireplace
 - Digesting your dinner
23. Which of the following substances is not a compound?
- Water
 - Table salt
 - Neon
 - Rust
24. Propane gas burns in oxygen to produce carbon dioxide, water, and energy. The reactants in this reaction are propane and
- Energy
 - Oxygen
 - Carbon dioxide
 - Water
25. Which is not true of an ionic bond? It involves
- A transfer of electrons
 - Sharing of electrons
 - Electrostatic attraction between ions
 - Metals and non-metals

26. A non-metal atom combines with a second non-metal atom. The first non-metal atom
 - a. Gains electrons
 - b. Loses electrons
 - c. Remains neutral
 - d. Shares electrons with the second atom
27. The combination of non-metals with non-metals forms
 - a. Covalent compounds
 - b. Metallic compounds
 - c. Ionic compounds
 - d. No compounds

ANSWERS:

d, b, a, a, c, a, a, b, a, a, c, c, a, a, b, a, b, c, d, c, b, a, c, b, b, d, a

Chemical Reactions

1. The relative arrangement of the atoms in a molecule is a (an)
 - a. Empirical formula
 - b. Structural formula
 - c. Molecular formula
 - d. Covalent formula
2. What is the meaning of the subscripts in a chemical formula?
 - a. Number of atoms of an element in a compound
 - b. Percent composition of that element in a compound
 - c. Number of molecules of that compound
 - d. Number of molecules in the reaction
3. "Atoms are neither created or destroyed in a chemical reaction" is statement of the
 - a. Law of definite proportions
 - b. Law of conservation of mass
 - c. Law of percent composition
 - d. Atomic theory
4. A solid that comes out of solution as result of an ion exchange reaction is called a
 - a. Precipitate
 - b. Contaminant
 - c. Base
 - d. Metal

5. A balanced chemical equation provides quantitative information about all the following except
 - a. Time of reaction
 - b. Atoms
 - c. Molecules
 - d. Atomic weights of reactants and products
6. The number of atoms in exactly 12.0 grams of Carbon-12 is called
 - a. Atomic number
 - b. Atomic weight
 - c. Avogadro's number
 - d. Molecular number
7. Any substance that contains Avogadro's number of particles is called a
 - a. Mole
 - b. Atomic number
 - c. gopher
 - d. pound
8. A material that speeds up a chemical reaction without being permanently changed by the reaction is called a (an)
 - a. Catalyst
 - b. Reactant
 - c. Product
 - d. Active metal
9. A balanced chemical equation has
 - a. The same number of molecules on both sides of the equation
 - b. The same kinds of molecules on both sides of the equation
 - c. The same number of each kind of atom on both sides of the equation
 - d. All of the above
10. The law of conservation of mass means that
 - a. Atoms are not lost or destroyed in a chemical reaction
 - b. The mass of a newly formed compound cannot be changed
 - c. In burning, part of the mass must be converted into fire in order for mass to be conserved
 - d. Molecules cannot be broken apart because this would result in less mass
11. A chemical equation is balanced by changing
 - a. Subscripts
 - b. Superscripts
 - c. Coefficients
 - d. Any of the above

12. In a replacement (single displacement) reaction, elements that have the most ability to hold onto their electrons are
- The most chemically active
 - The least chemically active
 - Not generally involved in replacement reactions
 - None of the above
13. A balanced chemical equation provides all of the following information except
- Molecular ratio of reactants and products
 - Mole ratio of reactants and products
 - Mass ratio of reactants and products
 - Exchange rate of reactants and products
14. An ion exchange (double displacement) reaction can be identified by all of the following except
- Formation of a precipitate
 - Generation of a gas
 - Formation of water
 - The required addition of heat

ANSWERS:

b, a, b, a, a, c, a, a, c, a, c, b, d, d

Water and Solutions

- A major use for water in the average home is for
 - Drinking and cooking
 - Bathing
 - Toilets
 - Laundry
- Freshwater is obtained from all the following except
 - Oceans
 - Streams
 - Lakes
 - Rivers
- A molecule with a positive end and a negative end is called a (an)
 - Polar molecule
 - Nonpolar molecule
 - Neutral molecule
 - Ionic molecule

4. The material present in a solution in the largest amount is the
 - a. Solvent
 - b. Solute
 - c. Salt
 - d. Molecules
5. The relative amount of solute and solvent in a solution is defined as the
 - a. Solubility
 - b. Miscibility
 - c. Concentration
 - d. Polarity
6. A solution with a state of equilibrium between the dissolving solute and solute coming out of solution is
 - a. Unsaturated
 - b. Saturated
 - c. Supersaturated
 - d. Undersaturated
7. The solubility of most ionic salts in water
 - a. Increases with temperature
 - b. Decreases with temperature
 - c. Depends on the amount of salt
 - d. Increase with stirring
8. Ionic substances that dissolve in water and conduct an electric current are called
 - a. Salts
 - b. Compounds
 - c. Molecules
 - d. Electrolytes
9. All of the following are electrolytes except
 - a. Acids
 - b. Salts
 - c. Bases
 - d. Sugars
10. What is an acid when it dissolved in water?
 - a. Proton acceptor
 - b. Proton donor
 - c. Indicator
 - d. Salt
11. The pH scale is based on the concentration of what in solution?
 - a. Hydroxide ions
 - b. Hydronium ions
 - c. Electrolytes
 - d. Solute

12. The products produced in a neutralization reaction are
- Acid and bases
 - Salt and water
 - Molecules and water
 - Salt and pepper
13. Which of the following is not a solution?
- Seawater
 - Carbonated water
 - Sand
 - Brass
14. Atmospheric air is a homogeneous mixture of gases that is mostly nitrogen gas. The nitrogen is therefore the
- Solvent
 - Solution
 - Solute
 - None of the above
15. A homogeneous mixture is made up of 95% alcohol and 5% water. In this case, water is the
- Solvent
 - Solution
 - Solute
 - None of the above
16. The solution concentration terms of parts per million (ppm), percent by volume, and percent by weight are concerned with the amount of
- Solvent in the solution
 - Solute in the solution
 - Solute compared to solvent
 - Solvent compared to solute
17. A concentration of 500 ppm is reported in a new article. This is the same concentration as
- 0.005 %
 - 0.05 %
 - 5 %
 - 50 %
18. According to the label, a bottle of vodka has a 40% by volume concentration. This means the vodka contains 40 mL of pure alcohol
- In each 140 mL of vodka
 - To every 100 mL of water
 - To every 60 mL of vodka
 - Mixed with water to make 100 mL of vodka

19. A salt solution has solid salt on the bottom of the container and salt is dissolving at the same rate that is it coming out of solution. You know the solution is
- An electrolyte
 - A nonelectrolyte
 - A buffered solution
 - A saturated solution
20. As the temperature of water decreases, the solubility of CO_2 in water
- Increases
 - Decreases
 - Remains the same
 - Increases then decreases
21. At what temperature does water have the greatest density?
- 100°C
 - 20°C
 - 4°C
 - 0°C
22. A certain solid salt is insoluble in water, so the strongest force must be the
- Ion-water molecule force
 - Ion-ion force
 - Force of hydration
 - Polar molecule force
23. Which of the following will conduct an electric current?
- Pure water
 - A water solution of a covalent compound
 - A water solution of an ionic compound
 - All of the above
24. The ice that forms in freezing seawater is
- Pure water
 - The same salinity as liquid seawater
 - More salty than liquid seawater
 - Denser than liquid seawater
25. Salt solutions freeze at a lower temperature than pure water because
- More ionic bonds are present
 - Salt solutions have a higher vapor pressure
 - Ions get in the way of water molecules trying to form ice
 - Salt naturally has a lower freezing point than water
26. Solutions of acids, bases, and salts have what in common? All have
- Proton acceptors
 - Proton donors
 - Ions
 - Polar molecules

27. When a solution of an acid and base are mixed together,
- A salt and water are formed
 - They lose their acid and base properties
 - Both are neutralized
 - All of the above
28. A substance that ionizes completely into hydronium ions is known as a
- Strong acid
 - Weak acid
 - Strong base
 - Weak base
29. A scale of values that expresses the hydronium ion concentration of a solution is known as
- An acid-base indicator
 - The pH scale
 - The solubility scale
 - The electrolyte scale
30. Substance A has a pH of 2 and a substance B has a pH of 3. This means
- Substance A has more basic properties than substance B
 - Substance B has more acidic properties than substance A
 - Substance A is 10 times more acidic than substance B
 - Substance B is 10 times more acidic than substance A
31. Water is a (an)
- Ionic compound
 - Covalent compound
 - Polar covalent compound
 - Triatomic molecule
32. Salt is spread on icy roads because it
- Lowers the freezing point of water
 - Increases the freezing point of water
 - Increases the boiling point of water
 - Increases the melting point of water
33. A solution has a pH of 9. This means that the solution is
- Acidic
 - Neutral
 - Basic
 - Unknown

ANSWERS:

c, a, a, a, c, b, a, d, d, b, b, b, c, a, c, b, b, d, d, a, c, b, c, a, c, c, d, a, b, c, c, a, c

Organic Chemistry

1. An organic compound consisting only of carbon and hydrogen is called a (an)
 - a. Hydrogen carbide
 - b. Hydrocarbon
 - c. Organic compound
 - d. Hydrocarbide
2. Carbon-to-carbon bonds are
 - a. Ionic
 - b. Polar covalent
 - c. Covalent
 - d. Metallic
3. Compounds with the same molecular formulas but with different structures are called
 - a. Isotopes
 - b. Allotropes
 - c. Isomers
 - d. Polymers
4. Hydrocarbons with double bonds are the
 - a. Alkanes
 - b. Alkenes
 - c. Alkynes
 - d. Alkines
5. A hydrocarbon with a carbon-to-carbon triple bond is an
 - a. Alkane
 - b. Alkene
 - c. Alkynes
 - d. Alkaline
6. Hydrocarbons that have one to four carbon atoms are
 - a. Gases
 - b. Liquids
 - c. Solids
 - d. Semisolids
7. The process where large hydrocarbons are converted into smaller ones is called
 - a. Snapping
 - b. Distillation
 - c. Cracking
 - d. Fractionation
8. The atom or group of atoms in an organic molecule that is the site of a chemical reaction is called the
 - a. Reaction site group
 - b. Functional group
 - c. Addition site
 - d. Reactant group

9. The hydroxyl, -OH, functional group is found in
- Ketone
 - Alkanes
 - Aldehydes
 - Alcohols
10. An organic compound is a compound that
- Contains carbon and was formed by a living organism
 - Is a natural compound
 - Contains carbon, whether it was formed by a living thing or not
 - Was formed by a plant
11. There are millions of organic compounds but only thousands of inorganic compounds because
- Organic compounds were formed by living things
 - There is more carbon on earth's surface than any other element
 - Atoms of elements other than carbon never combine with themselves
 - Carbon atoms can combine with up to four other atoms, including other carbon atoms
12. Isomers have
- The same chemical and physical properties
 - The same chemical but different physical properties
 - The same physical but different chemical properties
 - Different physical and chemical properties
13. Petroleum is believed to have formed mostly from the anaerobic decomposition of buried
- Dinosaurs
 - Fish
 - Pine trees
 - Plankton and algae
14. The R in ROH represents
- A functional group
 - A hydrocarbon group with a name ending in -yl
 - An atom of an inorganic element
 - A polyatomic ion that does not contain carbon
15. The OH in ROH represents
- A functional group
 - A hydrocarbon group with the name ending in -yl
 - The hydroxide ion, which ionizes to form a base
 - The site of chemical activity in a strong base
16. What is the proof of a "wine cooler" that is 5 percent alcohol by volume?
- 2.5 proof
 - 5 proof
 - 10 proof
 - 50 proof

17. A protein is a polymer formed from the linking of many
- Glucose units
 - DNA molecules
 - Amino acid molecules
 - Monosaccharides
18. Fats from animals and oils from plants have the general structure of a (an)
- Aldehyde
 - Ester
 - Amine
 - Ketone
19. Liquid oils from plants can be converted to solids by adding what to the molecule?
- Metal ions
 - Carbon
 - Polyatomic ions
 - Hydrogen
20. Many synthetic polymers become a problem in the environment because they
- Decompose to nutrients, which accelerates plant growth
 - Do not readily decompose and tend to accumulate
 - Do not contain vitamins as natural materials do
 - Become a source of food for fish but ruin the flavor of the fish meat
21. An organic molecule that does not contain the maximum number of hydrogen atoms is called
- Deficient
 - Unsaturated
 - Saturated
 - Incomplete
22. Aromatic hydrocarbons are often used as
- Perfumes
 - Soaps
 - Solvents
 - Odorants
23. The rate of combustion of gasoline is quantified by
- NASCAR rating
 - Octane rating
 - Kern rating
 - Leading number

24. The organic acid that is found in sour milk, pickles, and in your muscles as a product of carbohydrate metabolism is
- Acetic acid
 - Palmitic acid
 - Lactic acid
 - Citric acid
25. What are the organic compounds that are used in perfumes and for artificial flavors?
- Carboxylic acids
 - Alcohols
 - Ethers
 - Esters
26. Sugars, starches, and cellulose belong to which class of organic compounds?
- Proteins
 - Fatty acids
 - Carbohydrates
 - Enzymes

ANSWERS:

b, c, c, b, c, a, c, b, d, c, d, d, d, b, a, c, c, b, d, b, b, c, b, c, d, c