Import Settings:
Base Settings: Brownstone Default
Information Field: Difficulty
Highest Answer Letter: D
Multiple Keywords in Same Paragraph: No

Chapter: Chapter 2: Fundamentals of Chemistry

Multiple Choice

1. Which of the following pairs is mismatched?
A) Protein-amino acids
B) Nucleic acids- nucleotides
C) Carbohydrates- glucose
D) Fats- aldehyde

Ans: D
Difficulty: Medium
Feedback: 2.4

2. A nucleic acid has a “backbone” consisting of
A) nitrogenous bases
B) sugars
C) phosphates.
D) b and c

Ans: D
Difficulty: Hard
Feedback: 2.4

3. Proteins are chains of _____ that sometimes function as_____
A) disaccharides; cell wall
B) amino acids; enzymes
C) lipids; energy compounds
D) glycogen; enzymes

Ans: B
Difficulty: Easy
Feedback: 2.4

4. The total number of protons in an atom is equal to its
A) atomic weight
B) molecular weight
C) chemical weight
D) atomic number

Ans: D
Difficulty: Medium
Feedback: 2.2

5. Which one of the following pairs is matched correctly?
A) carbon-organic compounds
B) glucose- hydrogen bonds
C) ions-covalent bonds
D) phosphate-enzyme

Ans: A
Difficulty: Hard
Feedback: 2.4

6. When sodium hydroxide, a strong base, is added to water, the pH of the solution
A) goes up.
B) remains the same.
C) goes down.
D) cannot be determined.

Ans: A

Difficulty: Medium
Feedback: 2.3

7. The double helix is a structure associated with
A) disaccarides
B) a compound with hydrogen bonds
C) lipids
D) DNA

Ans: D
Difficulty: Easy
Feedback: 2.4

8. In order to become an ion, an atom of chlorine must
A) gain an electron
B) form a covalent bond
C) lose an electron
D) form a hydrogen bond

Ans: A
Difficulty: Hard
Feedback: 2.2

9. When proteins are made up of several polypeptide chains, the arrangement of these chains is referred to as:
A) primary structure
B) secondary structure
C) tertiary structure
D) quaternary structure

Ans: D
Difficulty: Hard
Feedback: 2.4

10. Two or more atoms combine to form
A) a cation.
B) a molecule.
C) a protein.
D) an ion.

Ans: B
Difficulty: Easy
Feedback: 2.2

11. Atoms take part in bond formation to
A) form polypeptides
B) attain a stable electron configuration
C) increase their charge density
D) increase their energy

Ans: B
Difficulty: Hard
Feedback: 2.2

12. Ions with opposite charges are generally held together by
A) covalent bonds
B) ionic bonds
C) hydrogen bonds
D) municipal bonds

Ans: B
Difficulty: Medium
Feedback: 2.2

13. The smallest particle of matter that can take part in chemical reactions
A) glucose
B) compound
C) neutron
D) atom

Ans: D

Difficulty: Easy
Feedback: 2.2

14. The three fundamental particles of the atom are
A) elements, molecules, compounds
B) ions, cations, anions.
C) proteins, lipids, sugars
D) proton, neutron, electron

Ans: D
Difficulty: Easy
Feedback: 2.2

15. Chemical reactions occur:
A) between elements that have magnetic repulsion.
B) rarely as very few elements have electrons in their outer shell.
C) during metabolism as they are necessary for making the substance of cells.
D) only in eukaryotes as they require a nucleus.

Ans: C
Difficulty: Easy
Feedback: 2.1

16. Combinations that form from mixtures of different elements are called
A) isotopes
B) atoms
C) ions
D) compounds

Ans: D
Difficulty: Easy
Feedback: 2.2

17. The atomic nucleus consists of:

A) cations and anions
B) protons, electrons and neutrons
C) protons and neutrons
D) solutes and colloids

Ans: C
Difficulty: Easy
Feedback: 2.2

18. Electrons that have more energy have a _____ charge and are found in the _____.
A) positive; inner electron shell
B) positive; outer electron shell
C) negative; nucleus
D) negative; outer electron shell

Ans: D
Difficulty: Easy
Feedback: 2.2

19. Chemically stable atoms are inert or less likely to form chemical bonds. What characterizes a chemically stable element?
A) has eight electrons in the outer shell
B) has the same number of protons as electrons
C) atomic number is equal to the atomic mass
D) forms hydrogen bonds

Ans: A
Difficulty: Medium
Feedback: 2.2

20. An ion is all of the following **except**:
A) a charged atom
B) an atom that has lost or gained one or more electrons
C) either a cation or an anion
D) an atom with the same number of protons as electrons

Ans: D

Difficulty: Hard
Feedback: 2.2

21. In salt, a sodium atom loses an electron to a chlorine atom. What is true about the chloride ion found in salt?
A) it has one less electron than proton
B) it is less chemically stable than a chlorine atom
C) it is an anion
D) it is in a covalent bond

Ans: C
Difficulty: Hard
Feedback: 2.2

22. What is **true** about atomic weights?
A) it is the sum of the number of electrons and protons in an atom.
B) the higher the atomic weight the more likely an atom will form a chemical bond
C) it is always a whole number
D) atoms of a particular element that have different atomic weights are called isotopes

Ans: D
Difficulty: Hard
Feedback: 2.2

23. Which statement is **true** for radioisotopes?
A) radioisotopes have unstable nuclei that emit subatomic particles and radiation
B) all radioisotopes have gained electrons
C) radioisotopes are useful to guard against radioactive elements
D) radioisotopes contain particles too large to form true solutions

Ans: A
Difficulty: Easy
Feedback: 2.2

24. The food we eat consists of molecules with lots of energy stored in their chemical bonds. What is true about how microorganisms use nutrients?
A) when microorganisms break the chemical bonds in nutrients they release energy
B) it takes microorganisms more energy to break the bonds in nutrients than are released
C) all energy that microorganisms receive from nutrients come from anabolism
D) microorganisms break down hydrogen bonds to release electrons as energy

Ans: A
Difficulty: Medium
Feedback: 2.2

25. Which is a **false** statement about water?
A) water molecules are polar
B) it has a high specific heat because of the extensive covalent bonds between molecules
C) hydrogen atoms in water form a region with a partial positive charge
D) water's polarity allows for many ionic compounds to be dissolved in it

Ans: B
Difficulty: Medium
Feedback: 2.3

26. Which is a **false** statement about chemical reactions
A) catabolic reactions are exergonic and release energy
B) polymerization and the building up of large molecules is a catabolic reaction
C) anabolic reactions require energy
D) energy is stored in the form of chemical bonds

Ans: B
Difficulty: Medium
Feedback: 2.2

27. When glucose is dissolved in water, the water is the _____ and the glucose is the _____.
A) solvent, solute
B) solvent, solution
C) solute, solvent
D) solute, solution

Ans: A
Difficulty: Medium
Feedback: 2.3

28. Water plays an important role in the chemical reactions in cells, including
A) denaturing proteins
B) stabilizing the primary structure of a protein
C) forming covalent bonds with proteins
D) breaking down large proteins into amino acids in hydrolysis reactions

Ans: D
Difficulty: Hard
Feedback: 2.3

29. Solutions made up of molecules that are not chemically bonded and are not limited to specific proportions are called
A) mixtures
B) elements
C) chemical compounds
D) polar compounds

Ans: A
Difficulty: Medium
Feedback: 2.3

30. Which of the following statements about solutions is **false**?
A) solute is the substance dissolved in a solvent
B) left alone on a counter a solution will separate out
C) solutes can consist of atoms, ions or molecules
D) in cells water is typically a solvent

Ans: B
Difficulty: Hard
Feedback: 2.3

31. Identify which of the following is not a colloid
A) salt water
B) gelatin desserts
C) agar plates used to grow microorganisms
D) fluid in cells

Ans: A
Difficulty: Hard
Feedback: 2.3

32. The pH scale is used to specify the acidity or alkalinity of a solution. Which of the following statements is **true**?
A) stomach acid has a pH around 10
B) neutral solutions, like water, have a pH of 10
C) a solution with a pH of 12 has 10 times the number of protons as a solution with a pH of 11
D) a strong base will have a pH less than 10.

Ans: C
Difficulty: Medium
Feedback: 2.3

33. Which statement about acids and bases is **false**?
A) A hydrogen ion (H+) is a proton.
B) Acids are proton acceptors.
C) Bases are hydroxyl ion donors
D) A hydroxyl ion donor is also a proton acceptor

Ans: B
Difficulty: Hard
Feedback: 2.3

34. Ketones, alcohol, aldehyde and organic acid are four of the organic compounds found in all living cells. What do these four classes of organic compounds share?
A) They contain the same atoms but differ in structure
B) They are chains of carbon atoms with functional groups that contain oxygen.

C) They are all fully oxidized.
D) They can only be synthesized inside a cell.

Ans: B
Difficulty: Hard
Feedback: 2.4

35. What is **true** about oxidation?
A) the more oxidized a molecule the less energy it contains
B) is the removal of oxygen or the addition of hydrogen or electrons to a substance
C) gasoline represents the extreme of energy-rich oxidized compounds
D) oxidation reactions only occur in polar compounds

Ans: A
Difficulty: Hard
Feedback: 2.4

36. Carbohydrates
A) are relatively insoluble in water
B) have a four ring structure
C) are used primarily for energy and cellular structures
D) have primary, secondary, tertiary and quaternary structure

Ans: C
Difficulty: Easy
Feedback: 2.4

37. Glucose
A) is abundant in milk and fruit
B) is a rare monosaccharide
C) can be oxidized to form deoxy sugar or alcohol
D) none of the above

Ans: D
Difficulty: Hard
Feedback: 2.4

38. Disaccharides, such as sucrose and lactose, are formed from
A) two monosaccharides connected by a glycoside bond
B) chains of two amino acids
C) a long chain of carbon atoms and a carboxyl group at one end of the chain
D) three fatty acids combined with glycerol

Ans: A
Difficulty: Easy
Feedback: 2.4

39. Polysaccharides
A) include ribose, fuctose and glucose
B) include cholesterol and vitamin D
C) are monosaccharides joined by glycoside bonds
D) are found only in eukaryotic cells

Ans: C
Difficulty: Medium
Feedback: 2.4

40. Fatty acids that are _____ have _____ .
A) saturated ; lost their secondary structure
B) unsaturated, a double bond between two carbons that have lost hydrogen atoms
C) saturated, one or more double bonds
D) denatured, all the hydrogen they can.

Ans: B
Difficulty: Hard
Feedback: 2.4

41. Phospholipids
A) have a charged phosphate group that can mix with water and an insoluble fatty acid
B) can serve as hormones
C) always remain liquid at room temperature

D) form straight chains in water

Ans: A
Difficulty: Medium
Feedback: 2.4

42. Atoms are most likely to form ions when they
A) have an even number of electrons in their outer shells
B) have a nearly empty outer shell
C) have an odd number of electrons in their outer shells
D) have four electrons in their outer shells

Ans: B
Difficulty: Medium
Feedback: 2.2

43. Chemical bonds form between atoms through the interaction of
A) protons
B) neutrons
C) electrons
D) isotopes

Ans: C
Difficulty: Easy
Feedback: 2.2

44. Chemical bonds found in living organisms **do not** normally include
A) ionic bonds
B) hydrogen bonds
C) covalent bonds
D) magnetic bonds

Ans: D
Difficulty: Medium
Feedback: 2.2

45. When pairs of electrons are shared between two atoms, the result is a _____ bond.
A) ionic
B) covalent
C) hydrogen
D) carbonic

Ans: B
Difficulty: Medium
Feedback: 2.2

46. Hydrogen bonds are generally
A) stronger than covalent bonds
B) stronger than ionic bonds but weaker than covalent bonds
C) present in large numbers
D) found in non-polar compounds

Ans: C
Difficulty: Medium
Feedback: 2.2

47. Reactions in which food is degraded and energy is released are best termed
A) anabolic
B) catabolic
C) metabolic
D) exerbolic

Ans: B
Difficulty: Easy
Feedback: 2.2

48. Anabolic reactions tend to
A) use energy and degrade food
B) produce energy, and degrade food
C) produce energy and new chemical bonds
D) use energy and produce new chemical bonds

Ans: D
Difficulty: Easy
Feedback: 2.2

49. Chemical reactions that require energy are best termed
A) catabolic
B) anabolic
C) exergonic
D) endergonic

Ans: D
Difficulty: Medium
Feedback: 2.2

50. Which of the following pH's would indicate the weakest acid
A) 2
B) 3
C) 4
D) 5

Ans: D
Difficulty: Easy

Feedback: 2.3

51. Organic molecules with the same molecular formula but different structures are
A) elements
B) isotopes
C) isomers
D) anions

Ans: C
Difficulty: Medium
Feedback: 2.4

52. Carbohydrates **do not** include which of the following
A) glucose
B) starch
C) cellulose
D) sterols

Ans: D
Difficulty: Medium
Feedback: 2.4

53. Amino acids in a protein are joined together by
A) peptide bonds
B) hydrogen bonds
C) phosphodiester bonds
D) tertiary bonds

Ans: A
Difficulty: Medium
Feedback: 2.4

54. The specific sequence of amino acids in a protein is known as the protein's
A) primary structure
B) secondary structure
C) tertiary structure
D) quaternary structure

Ans: A
Difficulty: Easy
Feedback: 2.4

55. In DNA, the nucleotide cytosine always base pairs to
A) adenine
B) guanine
C) thymine
D) uracil

Ans: B
Difficulty: Medium
Feedback: 2.4

Essay

56. Describe the formation and importance of a hydrogen bond. Why is water the universal dissolving medium (ie solvent) of life? Name two roles water plays in cells.
Ans: A hydrogen bond is a special type of bond that forms between a hydrogen atom that has a partial positive charge because of a bond to atoms that strongly attract electrons (ie oxygen or nitrogen) and another atom that has a partial negative charge. This type of bond always involves a hydrogen atom. The hydrogen bond is important because it is found between water molecules or because it contributes to the structure of large molecules such as proteins or nucleic acids.
Water is essential to life because water can act as a dissolving medium or solvent. Water is a good solvent because the polar water molecules surround ions. Or stated differently because many different kinds of ions can be distributed evenly throughout water because water is polar.
Water plays the following roles in cells: it keeps them moist by forming a thin film of water (surface tension), it is the medium for most chemical reactions, it allows many different ions to be dissolved in cells, it contributes to the structure of large molecules such as proteins or nucleic acids, it participates in dehydration and hydrolysis reactions.

Difficulty: Hard
Feedback: 2.2 and 2.3

57. Energy is an important chemical currency. How does energy affect electrons in the atom? What is the role of energy in a chemical bond? Name two complex organic molecules that are used by cells for energy. How does the cell release this energy?
Ans: Electrons can have different levels of energy. Electrons with the least energy are located nearest the nucleus and those with more energy are located farther away from the nucleus (and are most likely to interact to form bonds with other atoms).
Energy associated with chemical bonds hold the atoms together forming molecules. It is the energy from sharing the electrons that allows two atoms to form chemical bonds.
The cell uses fats, sugars, proteins and nucleic acids for energy and energy storage. The cell releases this energy by breaking down complex molecules (macromolecules) into simple molecules, for example polysaccharides into monosaccharides, proteins into amino acids, etc.

Or the cell releases this energy by breaking down high energy bonds (which have more energy than covalent bonds) that form within these chemicals- these bonds are found in nucleic acids (ie ATP), sugars, amino acids and lipids.

Difficulty: Medium
Feedback: 2.2 and 2.4

58. Describe the chemical composition, type/structure and function for all of the following complex organic molecules: carbohydrates, lipids, proteins, DNA and RNA
Ans: Carbohydrates are carbon chains or chains of sugars. The carbon atoms may be associated with alcohols or either a ketone or aldehyde group. A simple carbohydrate may contain one sugar (monosaccharide) or many sugars (polysaccharide) and a long chain of repeating sugars is called a polymer. Microbes use carbohydrates for immediate energy, storage of energy and cell walls.
Lipids are composed of molecules that form a substance that is insoluble in water. They include fats, phospholipids and steroids. They are used for energy storage and cell membranes.
Proteins consist of chains of amino acids linked by peptide bonds. They form part of the structure of the cells and act as enzymes.
DNA and RNA are composed of chains of nucleotides (nitrogenous base, sugar, phosphates). DNA molecules form double strained alpha helixes. RNA is usually single stranded. DNA and RNA serve as the genetic material (information encoding molecules) for viruses and all living organisms.

Difficulty: Medium
Feedback: 2.4