## The Chemistry of Biology

**Multiple Choice Questions**

1. Anything that occupies space and has mass is called   
A. Atomic  
B. Living  
**C.** Matter  
D. Energy  
E. Space

2. The electrons of an atom are   
A. Always equal to the number of neutrons in an atom  
B. Found in the nucleus  
C. Used to determine atomic number  
D. Positively charged  
**E.** Moving in pathways called orbitals

3. The electrons of an atom are   
**A.** Always equal to the number of protons  
B. Used to determine the atomic weight  
C. Carrying a positive charge  
D. Used to determine the atomic number  
E. Always in full orbitals

4. All of the following pertain to the atom carbon-14 except   
A. Has 6 protons  
B. Has 6 electrons  
**C.** Has 14 neutrons  
D. Is an isotope of carbon  
E. All of the choices pertain to carbon-14

5. The subatomic particles that surround the nucleus are the   
**A.** Electrons  
B. Protons  
C. Neutrons  
D. Protons and neutrons  
E. Protons and electrons

6. Isotopes are atoms of the same element that differ in their   
**A.** Neutron number  
B. Electron number  
C. Proton number  
D. Atomic number  
E. Chemical properties

7. What is the maximum number of electrons in the second energy shell of an atom?   
A. 2  
B. 4  
**C.** 8  
D. 18  
E. 32

8. What is the maximum number of electrons in the first energy shell of an atom?   
**A.** 2  
B. 4  
C. 8  
D. 18  
E. 32

9. Protons and neutrons make up the atom's central core referred to as its   
A. Valence number  
B. Isotope  
**C.** Nucleus  
D. Center of gravity  
E. None of the choices are correct

10. The valence number is the   
A. Number of protons  
B. Number of neutrons  
C. Atomic weight  
D. Number of inner most electrons  
**E.** Number of outer most electrons

11. Two or more atoms bonded together are called a/an   
A. Ion  
B. Isotope  
C. Element  
D. Electrolyte  
**E.** Molecule

12. What would be the valence number of electrons in the sulfur (S) atom?   
A. 2  
**B.** 6  
C. 8  
D. 16  
E. 32

13. Polar molecules are composed of covalently bonded   
A. Identical atoms  
B. Carbon atoms  
C. Ions  
**D.** Atoms of different electro negativity  
E. Atoms of identical electro negativity

14. Polar molecules   
A. Have an equal charge distribution  
**B.** Have an unequal charge distribution  
C. Are insoluble in water  
D. Always contain carbon  
E. Always involve oxygen

15. Covalent bonds   
A. Result from losing electrons  
B. Are always polar  
C. Are always non-polar  
**D.** Result from sharing electrons  
E. Result from gaining electrons

16. Cations are a(n)   
A. Charged subatomic particles  
B. Atoms that have gained electrons  
C. Atoms that have gained neutrons  
**D.** Capable of forming ionic bonds with anions  
E. Atoms without protons

17. A reaction where an electron is lost is called   
**A.** Oxidation  
B. Reduction  
C. Ionization  
D. Decomposition  
E. Dissolution

18. An atom has gained an electron. It has been   
A. Oxidized  
**B.** Reduced  
C. Ionized  
D. Deionized  
E. Neutralized

19. Ionic bonds   
A. Result from sharing electrons  
**B.** Result from transferring electrons  
C. Results from like charge attraction  
D. Are the weakest chemical bonds  
E. Always involve carbon

20. Hydrogen bonds   
**A.** Result from attractive forces between molecules with polar covalent bonds  
B. Result from attractive forces between molecules with polar ionic bonds  
C. Result from attractive forces between molecules with non-polar covalent bonds  
D. Result from attractive forces between molecules with non-polar ionic bonds  
E. Are the strongest bonds between molecules

21. Atoms that gain or lose electrons become charged particles called   
A. Cations  
B. Anions  
**C.** Ions  
D. Isotopes  
E. All of the choices are correct

22. Substances that release ions when dissolved in water and conduct electricity are   
A. Covalent  
B. Nonpolar  
C. Electrons  
**D.** Electrolytes  
E. Solvents

23. Which of the following represents a synthesis reaction?   
A. AB → A + B  
**B.** A + B → AB  
C. AB + XY → AX + BY  
D. AB + XY ↔ AX + BY  
E. None of the choices are correct

24. Which of the following represents a reversible reaction?   
A. AB → A + B  
B. A + B → AB  
C. AB + XY → AX + BY  
**D.** AB + XY ↔ AX + BY  
E. None of the choices are correct

25. The important solvent associated with living things is   
A. Carbon dioxide  
B. Sodium chloride  
C. Ethyl alcohol  
D. Benzene  
**E.** Water

26. Ionic compounds are   
A. Hydrophobic  
**B.** Hydrophilic  
C. Are acidic in solution  
D. Are basic in solution  
E. Always form salts in solution

27. A solution is composed of one or more substances called \_\_\_\_\_ that are uniformly dispersed in a dissolving medium called a \_\_\_\_\_.   
A. Solvent, solute  
**B.** Solute, solvent  
C. Neither solvent, solute nor solute, solvent  
D. Both solvent, solute and solute, solvent

28. Which term does **not** belong in this list?   
A. Lactic acid  
B. Vinegar  
C. Hydrogen ion donor  
**D.** PH 8  
E. Acidic

29. A solution of pH 7 compared to a solution of pH 9   
A. Is more basic  
B. Has no OH- ions  
**C.** Has more H+ ions  
D. Has a higher pH  
E. All of the choices are correct

30. A solution of pH 7 compared to a solution of pH 9   
A. 2 times more acidic  
B. 20 times more acidic  
C. 20 times more basic  
**D.** 100 times more acidic  
E. 100 times more basic

31. Which of the following functional groups is **mismatched** to the organic compound?   
**A.** Phosphate-carbohydrates  
B. Sulfhydryl-proteins  
C. Amino-proteins  
D. Hydroxyl-alcohols  
E. Carboxyl-fatty acids

32. Organic chemicals always have a basic framework of the element \_\_\_\_\_ bonded to other atoms.   
**A.** Carbon  
B. Nitrogen  
C. Oxygen  
D. Hydrogen  
E. Phosphorous

33. Most biochemical macromolecules are polymers, which are   
A. Chains of hydrophobic molecules  
B. Chains of electrolytic molecules  
**C.** Chains of repeating monomers  
D. Chains of repeating carbohydrates  
E. Chains of hydrogen bonds

34. All of the following are monosaccharides **except**   
A. Glucose  
**B.** Glycogen  
C. Fructose  
D. Ribose  
E. Deoxyribose

35. Which of the following would have glycosidic bonds?   
A. Triglycerides  
B. Monosaccharides  
C. Polypeptides  
**D.** Polysaccharides  
E. ATP

36. All of the following are polysaccharides **except**   
A. Dextran in some bacterial slime layers  
B. Agar used to make solid culture media  
C. A cell's glycocalyx  
D. Cellulose in certain cell walls  
**E.** Prostaglandins in inflammation

37. C6H12O6 + C6H12O6 → C12 H22O11 + H2O represents   
A. Formation of a peptide bond  
B. A decomposition reaction  
C. Denaturation  
D. Formation of a polysaccharide  
**E.** Dehydration synthesis

38. Starch is the primary storage food for all of the following **except**   
A. Green plants  
B. Algae  
**C.** Animals  
D. Some fungi  
E. All of the above store food as starch

39. All of the following are lipids **except**   
A. Cholesterol  
**B.** Starch  
C. Phospholipid  
D. Wax  
E. Triglyceride

40. What part of a phospholipid forms hydrophobic tails?   
**A.** Fatty acids  
B. Glycerol  
C. Phosphate  
D. Alcohol  
E. All of the choices are correct

41. A fat is called \_\_\_\_\_ if all carbons of the fatty acid chain are single bonded to 2 other carbons and 2 hydrogens.   
A. Unsaturated  
B. Polyunsaturated  
C. Monounsaturated  
**D.** Saturated  
E. None of the choices are correct

42. The lipid group that serves as energy storage molecules are   
A. Prostaglandins  
B. Waxes  
C. Phospholipids  
D. Steroids  
**E.** Triglycerides

43. The lipid group that is the major component of cell membranes are the   
A. Prostaglandins  
B. Waxes  
**C.** Phospholipids  
D. Steroids  
E. Triglycerides

44. The building blocks of an enzyme are   
A. Nucleotides  
B. Glycerol and fatty acids  
C. Monosaccharides  
D. Phosphate, glycerol, fatty acids  
**E.** Amino acids

45. An amino acid contains all of the following **except**   
A. An amino group  
B. A carboxyl group  
C. A variable R group  
D. An α carbon  
**E.** A nitrogen base

46. Which is **not** true about enzymes?   
A. Found in all cells  
B. Are catalysts  
C. Participate in the cell's chemical reactions  
D. Can be denaturated by heat and other agents  
**E.** Have high-energy bonds between phosphates

47. Which amino acid contains sulfur atoms that form covalent disulfide bonds in its tertiary structure?   
A. Valine  
**B.** Cysteine  
C. Serine  
D. Alanine  
E. Tyrosine

48. What type of bonds are formed by dehydration synthesis between adjacent amino acids?   
A. Glycosilic  
B. Ester  
**C.** Peptide  
D. Disulfide  
E. Phosphate

49. The α – helix is a type of \_\_\_\_\_ protein structure.   
A. Primary  
**B.** Secondary  
C. Tertiary  
D. Quaternary  
E. None of the above

50. One nucleotide contains   
A. One phosphate  
B. One pentose sugar  
C. One nitrogen base  
**D.** All of the choices are correct  
E. None of the choices are correct

51. Which pertains to DNA but **not** to RNA?   
A. Contains ribose  
B. Contains adenine  
**C.** Contains thymine  
D. Contains uracil  
E. Contains nucleotides

52. ATP is best described as   
A. An enzyme  
B. A double helix  
C. An electron carrier  
**D.** The energy molecule of cells  
E. All of the choices are correct

53. A student forgot to label a beaker containing a DNA solution and a beaker containing a glucose solution. If chemical analysis was performed to identify the contents of each beaker, which of the following would be found in the beaker of DNA but **not** in the beaker with glucose?   
A. Amino acids  
B. Hydrogen and oxygen atoms  
**C.** Nitrogen and phosphorus  
D. Fatty acids  
E. Carbon atoms

54. Purines and pyrimidines are components in the building block units of all   
**A.** Nucleic acids  
B. Carbohydrates  
C. Polysaccharides  
D. Amino acids  
E. Enzymes

55. Which of the following is **not** a pyrimidine?   
A. Uracil  
**B.** Adenine  
C. Thymine  
D. Cytosine  
E. All of the above are pyrimidines

56. During protein synthesis, \_\_\_\_ RNA is made to be a copy of a gene from the DNA.   
A. Transfer  
**B.** Messenger  
C. Ribosomal  
D. All of the choices are correct

**True / False Questions**

57. Elements have predictable chemical properties.   
**TRUE**

58. Electrons that participate in chemical bonding are typically located closest to the nucleus.   
**FALSE**

59. Water molecules are nonpolar molecules.   
**FALSE**

60. Polar molecules have more reactivity compared to nonpolar molecules.   
**TRUE**

61. A covalent bond is formed between an anion and a cation.   
**FALSE**

62. Only charged atoms can form ionic bonds.   
**TRUE**

63. The concentration of a solution expresses the amount of solvent present.   
**FALSE**

64. If solution A has a lower pH compared to solution B, then solution A is more acidic than solution B.   
**TRUE**

65. The only part of an amino acid that differs from other amino acids is its R group.   
**TRUE**

66. All proteins are enzymes.   
**FALSE**

67. The most important outcome of polypeptide intrachain bonding and folding is the unique shape of the protein.   
**TRUE**

68. Nucleic acids have primary, secondary, tertiary and quaternary levels of organization.   
**FALSE**