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| 1. Organisms on earth are considered alive if they possess five major characteristics. Yet, although the mule is considered a living organism, it actually doesn’t meet the strict biological definition of life because it is unable to:   |  |  |  | | --- | --- | --- | |  | a. | grow. | |  | b. | maintain homeostasis. | |  | c. | obtain and use energy. | |  | d. | sense and respond to stimuli. | |  | e. | reproduce. |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 2. When a plant bends toward sunlight, the bending is an example of which characteristic of life?   |  |  |  | | --- | --- | --- | |  | a. | growth | |  | b. | reproduction | |  | c. | sensing and responding to environmental stimuli | |  | d. | obtaining and using energy | |  | e. | maintaining a stable internal environment |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 3. The ability of living organisms to maintain a stable internal environment is termed:   |  |  |  | | --- | --- | --- | |  | a. | feedback inhibition. | |  | b. | anabolism. | |  | c. | catabolism. | |  | d. | homeostasis. | |  | e. | metabolism. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 4. If life exists on Mars, what form is it likely to be?   |  |  |  | | --- | --- | --- | |  | a. | microscopic | |  | b. | silicon based | |  | c. | large and mobile | |  | d. | the same as on Earth | |  | e. | intelligent |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 5. The NASA rover *Curiosity* is looking for signs of life on Mars by analyzing soil for what substance?   |  |  |  | | --- | --- | --- | |  | a. | inorganic molecules | |  | b. | organic molecules | |  | c. | carbon dioxide | |  | d. | water | |  | e. | oxygen |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 6. Scientists have strong evidence that water on Mars:   |  |  |  | | --- | --- | --- | |  | a. | is in liquid form. | |  | b. | forms a cloud of vapor. | |  | c. | is absent in frozen form. | |  | d. | was present in liquid form in the past. | |  | e. | has a different molecular structure than water on Earth. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 7. Cyanobacteria:   |  |  |  | | --- | --- | --- | |  | a. | first evolved approximately 2.5 billion years ago. | |  | b. | are sensitive to extreme conditions. | |  | c. | added carbon dioxide to Earth’s early atmosphere. | |  | d. | are multicellular organisms. | |  | e. | require a warm environment to grow. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 8. Which of these are considered nonliving, according to most scientists?   |  |  |  | | --- | --- | --- | |  | a. | viruses and bacteria that grow in arsenic | |  | b. | cyanobacteria and viruses | |  | c. | prions and mules | |  | d. | cyanobacteria and bacteria that grow in arsenic | |  | e. | prions and viruses |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 9. Viruses and bacteria are both microorganisms common on Earth. Although bacteria are considered living, viruses are not. Viruses not defined as living organisms because they:   |  |  |  | | --- | --- | --- | |  | a. | are unable to grow. | |  | b. | are unable to reproduce without infecting other cells. | |  | c. | do not maintain homeostasis in their environments. | |  | d. | cannot respond to stimuli in their environments. | |  | e. | do not use any known form of energy. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 10. The periodic table is a chart describing the:   |  |  |  | | --- | --- | --- | |  | a. | known elements ordered by their atomic number. | |  | b. | number of electrons of each element. | |  | c. | size of an element. | |  | d. | elements that are found in living organisms. | |  | e. | abundance of each element on Earth. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 11. Each element is made up of a unique type of:   |  |  |  | | --- | --- | --- | |  | a. | atom. | |  | b. | protein. | |  | c. | neutron. | |  | d. | proton and neutron. | |  | e. | macromolecule. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 12. Elements are ordered in the periodic table by their atomic:   |  |  |  | | --- | --- | --- | |  | a. | weight or electron and neutron number. | |  | b. | mass or electron and proton number. | |  | c. | number or electron number. | |  | d. | number or proton number. | |  | e. | number or proton and neutron number. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 13. The smallest unit of an element that still retains the property of an element is a(n):   |  |  |  | | --- | --- | --- | |  | a. | proton. | |  | b. | neutron. | |  | c. | electron. | |  | d. | atom. | |  | e. | molecule. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 14. Which statement is TRUE?   |  |  |  | | --- | --- | --- | |  | a. | Protons, neutrons, and electrons are found inside the nucleus of an atom. | |  | b. | Protons and electrons are found in the nucleus, and neutrons orbit around them. | |  | c. | Protons and neutrons are found in the nucleus, and electrons orbit around them. | |  | d. | Electrons are relatively heavy compared to protons and neutrons. | |  | e. | Protons are positively charged, whereas electrons are neutral. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 15. The smallest unit of matter that exhibits the characteristics of an element and cannot be chemically divided into a smaller unit is a/an:   |  |  |  | | --- | --- | --- | |  | a. | atom. | |  | b. | electron. | |  | c. | proton. | |  | d. | nucleus. | |  | e. | neutron. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 16. An element’s atomic number, and thus its chemical identity, refers to its number of:   |  |  |  | | --- | --- | --- | |  | a. | protons. | |  | b. | neutrons. | |  | c. | electrons. | |  | d. | protons and neutrons. | |  | e. | protons and electrons. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 17. The atomic mass is equal to the number of:   |  |  |  | | --- | --- | --- | |  | a. | protons. | |  | b. | neutrons. | |  | c. | electrons. | |  | d. | protons plus the number of neutrons. | |  | e. | protons plus the number of electrons. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 18. The number of protons plus the number of neutrons equals the:   |  |  |  | | --- | --- | --- | |  | a. | atomic number. | |  | b. | atomic mass. | |  | c. | number of electrons. | |  | d. | number of bonds the atom can form. | |  | e. | electrical charge of the atom. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 19. What is the atomic mass of lithium (atomic number = 3)?   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 3 | |  | c. | 4 | |  | d. | 6 | |  | e. | 9 |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 20. What is the atomic mass of calcium (atomic number = 20)?   |  |  |  | | --- | --- | --- | |  | a. | 20 | |  | b. | 40 | |  | c. | 30 | |  | d. | 10 | |  | e. | 60 |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 21. An isotope is the form of an element that has more or fewer neutrons than its most common form. Knowing this, what is the atomic number of an isotope with one extra neutron, if its atomic mass is 15?   |  |  |  | | --- | --- | --- | |  | a. | 7 | |  | b. | 8 | |  | c. | 14 | |  | d. | 16 | |  | e. | 30 |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 22. The atomic particles responsible for forming bonds with other atoms are:   |  |  |  | | --- | --- | --- | |  | a. | protons. | |  | b. | neutrons. | |  | c. | electrons. | |  | d. | protons and neutrons. | |  | e. | protons and electrons. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 23. Which statement about neutrons is CORRECT?   |  |  |  | | --- | --- | --- | |  | a. | An atom has the same number of neutrons and electrons. | |  | b. | Most neutrons are found in the last two shells of the atom. | |  | c. | All neutrons are found in the valence shell of the atom. | |  | d. | One-half of neutrons are positive and one-half are negative, giving them an overall neutral charge. | |  | e. | All neutrons are found in the nucleus of the atom. |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 24. Potassium (K) has an atomic number of 19, and it has 20 neutrons. What is its atomic mass?   |  |  |  | | --- | --- | --- | |  | a. | 19 | |  | b. | 20 | |  | c. | 38 | |  | d. | 39 | |  | e. | 40 |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 25. How many electrons does carbon (atomic number = 6) contain in its outer valence shell?   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | 4 | |  | e. | 6 |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 26. How many electrons does carbon (atomic number = 6) contain in its first and second valence shells?   |  |  |  | | --- | --- | --- | |  | a. | 1; 5 | |  | b. | 2; 4 | |  | c. | 3; 3 | |  | d. | 4; 2 | |  | e. | 5; 1 |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 27. Which list displays the most abundant elements in the human body from most abundant to least abundant?   |  |  |  | | --- | --- | --- | |  | a. | oxygen→hydrogen→nitrogen→carbon | |  | b. | oxygen→carbon→hydrogen→nitrogen | |  | c. | hydrogen→oxygen→carbon→nitrogen | |  | d. | hydrogen→carbon→oxygen→nitrogen | |  | e. | nitrogen→carbon→oxygen→hydrogen |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 28. A covalent bond can best be described as:   |  |  |  | | --- | --- | --- | |  | a. | two atoms sharing electrons. | |  | b. | two atoms sharing protons. | |  | c. | one atom losing an electron to another, and then sticking to it due to the attraction between opposite charges. | |  | d. | one atom losing a proton to another, and then sticking to it due to the attraction between opposite charges. | |  | e. | a bond between atoms of two different elements. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 29. What is the maximum number of atoms to which a single carbon can bind?   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | 4 | |  | e. | 6 |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 30. A covalent bond is formed by:   |  |  |  | | --- | --- | --- | |  | a. | the donation of an electron from one atom to another. | |  | b. | the acceptance of an electron from one atom to another. | |  | c. | both donation and acceptance of an electron between atoms. | |  | d. | the sharing of electrons between atoms. | |  | e. | a weak interaction between two atoms’ electrons. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 31. Which molecule is considered an inorganic molecule?   |  |  |  | | --- | --- | --- | |  | a. | carbon dioxide | |  | b. | glucose | |  | c. | protein | |  | d. | sugar | |  | e. | a hydrocarbon skeleton |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 32. An organic molecule must have:   |  |  |  | | --- | --- | --- | |  | a. | carbon. | |  | b. | a hydrogen–carbon bond. | |  | c. | hydrogen. | |  | d. | covalent bonds. | |  | e. | ionic bonds. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 33. Organic molecules contain at least:   |  |  |  | | --- | --- | --- | |  | a. | three carbon to hydrogen bonds. | |  | b. | one carbon to oxygen bond. | |  | c. | one ionic bond. | |  | d. | one carbon to hydrogen bond. | |  | e. | one hydrogen to oxygen bond. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 34. Carbon has \_\_\_\_\_ potential bonding sites.   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 4 | |  | d. | 8 | |  | e. | 3 |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 35. A bond formed by atoms sharing electrons is known as a(n):   |  |  |  | | --- | --- | --- | |  | a. | ionic bond. | |  | b. | electric bond. | |  | c. | covalent bond. | |  | d. | shared bond. | |  | e. | hydrogen bond. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 36. The molecules used to store large amounts of energy and provide thermal insulation and padding in animals are:   |  |  |  | | --- | --- | --- | |  | a. | sterols. | |  | b. | phospholipids. | |  | c. | fats. | |  | d. | water. | |  | e. | proteins. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 37. DNA, deoxyribonucleic acid, has a “backbone” of sugars and:   |  |  |  | | --- | --- | --- | |  | a. | phosphate groups. | |  | b. | starch. | |  | c. | acids. | |  | d. | glycogen. | |  | e. | glycerol. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 38. There are \_\_\_\_\_ different amino acids.   |  |  |  | | --- | --- | --- | |  | a. | 12 | |  | b. | 73 | |  | c. | 21 | |  | d. | 5 | |  | e. | 20 |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 39. Sterols are:   |  |  |  | | --- | --- | --- | |  | a. | lipids. | |  | b. | carbohydrates. | |  | c. | proteins. | |  | d. | nucleic acids. | |  | e. | important solvents. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 40. The macromolecules that are known to be insoluble in water are:   |  |  |  | | --- | --- | --- | |  | a. | carbohydrates. | |  | b. | proteins. | |  | c. | lipids. | |  | d. | nucleic acids. | |  | e. | amino acids. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 41. The monomers of proteins are   |  |  |  | | --- | --- | --- | |  | a. | nucleic acids. | |  | b. | amino acids. | |  | c. | nucleotides. | |  | d. | lipids. | |  | e. | monosaccharides. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 42. An example of a nucleic acid is:   |  |  |  | | --- | --- | --- | |  | a. | DNA. | |  | b. | protein. | |  | c. | glucose. | |  | d. | fat. | |  | e. | sugar. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 43. When you eat more food than your body requires, you will store the extra energy as:   |  |  |  | | --- | --- | --- | |  | a. | proteins. | |  | b. | carbohydrates. | |  | c. | lipids. | |  | d. | proteins and lipids. | |  | e. | carbohydrates and lipids. |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 44. DNA differs from RNA because RNA:   |  |  |  | | --- | --- | --- | |  | a. | is not made up of nucleotides, but DNA is. | |  | b. | is a nucleotide, whereas DNA is a nucleic acid. | |  | c. | does not contain a sugar molecule, but DNA does. | |  | d. | is only one linear chain, whereas DNA consists of two chains bonded together. | |  | e. | has an attached lipid, but DNA does not. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 45. What is the basic structural unit of life?   |  |  |  | | --- | --- | --- | |  | a. | membranes | |  | b. | molecules | |  | c. | cells | |  | d. | organisms | |  | e. | atoms |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 46. If you were to dissect a plant into smaller and smaller units, what is the smallest unit that would still be considered alive?   |  |  |  | | --- | --- | --- | |  | a. | whole plant | |  | b. | leaves | |  | c. | cells | |  | d. | cell membranes | |  | e. | cell DNA |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 47. Cells are able to maintain a separate and distinct internal environment from the external environment because they have a(n):   |  |  |  | | --- | --- | --- | |  | a. | internal negative charge. | |  | b. | nucleus. | |  | c. | water barrier. | |  | d. | cell membrane. | |  | e. | rigid cell wall. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 48. Which part of a cell membrane phospholipid is exposed to the aqueous (watery) exterior?   |  |  |  | | --- | --- | --- | |  | a. | glycerol backbone | |  | b. | hydrophilic tail | |  | c. | hydrophilic head | |  | d. | hydrophobic head | |  | e. | hydrophobic tail |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 49. Which part of a cell membrane phospholipid is exposed to the aqueous (watery) interior?   |  |  |  | | --- | --- | --- | |  | a. | glycerol backbone | |  | b. | hydrophilic tail | |  | c. | hydrophilic head | |  | d. | hydrophobic head | |  | e. | hydrophobic tail |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 50. Why is a cell membrane like a phospholipid sandwich?   |  |  |  | | --- | --- | --- | |  | a. | The lipid is the bread, and proteins are the spread. | |  | b. | It is a two-layered semipermeable structure with heads on the outside, tails in the middle, and heads on the inside. | |  | c. | It is a two-layered semipermeable structure with tails on the outside, heads in the middle, and tails on the inside. | |  | d. | It is a two-layered semipermeable structure with tails on the outside, tails on the inside, and heads in the middle. | |  | e. | It is a one-layered semipermeable structure with heads on the outside and heads on the inside. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 51. Hydrophobic means:   |  |  |  | | --- | --- | --- | |  | a. | not quite alive, similar to a virus. | |  | b. | something that will not dissolve in water. | |  | c. | water-loving. | |  | d. | a solute. | |  | e. | something with a negative charge. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 52. In a water molecule, hydrogen atoms are bonded to oxygen by \_\_\_\_\_ bonds, whereas neighboring water molecules are held together by \_\_\_\_\_ bonds.   |  |  |  | | --- | --- | --- | |  | a. | polar covalent; hydrogen | |  | b. | hydrogen; polar covalent | |  | c. | ionic; polar covalent | |  | d. | polar covalent; ionic | |  | e. | ionic; hydrogen |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 53. Which of these is an example of a molecule that has polar covalent bonds?   |  |  |  | | --- | --- | --- | |  | a. | salt | |  | b. | phosphorus | |  | c. | carbon dioxide | |  | d. | methane | |  | e. | water |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 54. A substance that is dissolved in water is called a:   |  |  |  | | --- | --- | --- | |  | a. | solute. | |  | b. | solution. | |  | c. | solvent. | |  | d. | suspension. | |  | e. | salt. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 55. Because of the polar nature of water, it is a universal:   |  |  |  | | --- | --- | --- | |  | a. | solute. | |  | b. | solution. | |  | c. | solvent. | |  | d. | suspension. | |  | e. | salt. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 56. When making sugar water, the sugar is the \_\_\_\_\_, whereas the water is the \_\_\_\_\_.   |  |  |  | | --- | --- | --- | |  | a. | solute; solvent | |  | b. | solvent; solute | |  | c. | solute; solution | |  | d. | solution; solute | |  | e. | solvent; solution |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 57. An ion can be formed by the:   |  |  |  | | --- | --- | --- | |  | a. | loss of a proton. | |  | b. | gain of a proton. | |  | c. | loss of an electron. | |  | d. | gain of an electron. | |  | e. | loss or gain of an electron. |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 58. The hydrogen bonds between water molecules are:   |  |  |  | | --- | --- | --- | |  | a. | ionic. | |  | b. | covalent. | |  | c. | strong. | |  | d. | weak. | |  | e. | repellent. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 59. The surface tension of water is an example of:   |  |  |  | | --- | --- | --- | |  | a. | capillary action. | |  | b. | adhesion. | |  | c. | cohesion. | |  | d. | covalent bonding. | |  | e. | strong hydrogen bonds. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 60. The attraction that water molecules have for other water molecules is called \_\_\_\_\_, whereas the attraction that water molecules have for non-water molecules is called \_\_\_\_\_.   |  |  |  | | --- | --- | --- | |  | a. | ionic bonding; cohesion | |  | b. | adhesion; ionic bonding | |  | c. | cohesion; ionic bonding | |  | d. | adhesion; cohesion | |  | e. | cohesion; adhesion |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 61. The \_\_\_\_\_ of water molecules explains how some insects can walk on water.   |  |  |  | | --- | --- | --- | |  | a. | solubility | |  | b. | cohesion | |  | c. | aversion | |  | d. | adhesion | |  | e. | movement |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 62. A solution with a pH less than 7 is called a(n) \_\_\_\_\_ and has a higher number of \_\_\_\_\_ than a solution with a pH greater than 7.   |  |  |  | | --- | --- | --- | |  | a. | base; H+ | |  | b. | acid; H+ | |  | c. | base; OH– | |  | d. | acid; OH– | |  | e. | base; both H+ and OH– |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 63. If 1 liter of a solution with pH = 5 is added to 1 liter of a solution with pH = 9, what will the pH of the mixture be?   |  |  |  | | --- | --- | --- | |  | a. | 5 | |  | b. | 6 | |  | c. | 7 | |  | d. | 8 | |  | e. | 9 |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 64. A solution with a pH of 3.5 would be considered:   |  |  |  | | --- | --- | --- | |  | a. | basic. | |  | b. | neutral. | |  | c. | acidic. | |  | d. | buffered. | |  | e. | saline. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 65. A solution with a pH of 8.5 would be considered:   |  |  |  | | --- | --- | --- | |  | a. | basic. | |  | b. | neutral. | |  | c. | acidic. | |  | d. | buffered. | |  | e. | saline. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 66. Acidosis of blood occurs at what pH?   |  |  |  | | --- | --- | --- | |  | a. | 8 | |  | b. | >7.35 | |  | c. | <7.35 | |  | d. | 2 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 67. If coffee has a pH of 5 and soda a pH of 4, which is more acidic and by how much?   |  |  |  | | --- | --- | --- | |  | a. | Coffee is slightly more acidic than soda. | |  | b. | Coffee is 10 times more acidic than soda. | |  | c. | Soda is 10 times less acidic than coffee. | |  | d. | Soda is 10 times more acidic than coffee. | |  | e. | Soda is slightly less acidic than coffee. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 68. pH is a measure of the:   |  |  |  | | --- | --- | --- | |  | a. | acidity of a solution. | |  | b. | neutrality of a solution. | |  | c. | alkalinity of a solution. | |  | d. | amount of free electrons in a solution. | |  | e. | concentration of hydrogen ions in a solution. |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 69. Pure water has a pH of:   |  |  |  | | --- | --- | --- | |  | a. | 7 | |  | b. | 6 | |  | c. | 12 | |  | d. | 0 | |  | e. | 14 |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 70. In a healthy human, pH is generally maintained in the range of:   |  |  |  | | --- | --- | --- | |  | a. | 7.0 | |  | b. | 2.9 | |  | c. | 12.6 | |  | d. | 7.4 | |  | e. | 8.0 |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 71. Some of the properties that define life include:   |  |  |  | | --- | --- | --- | |  | a. | containing chemical elements. | |  | b. | growth. | |  | c. | moving from place to place. | |  | d. | decomposing. | |  | e. | using energy from food. |  |  |  | | --- | --- | | *ANSWER:* | b, e | |

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| 72. The biological definition of being “alive” means that organisms are able to:   |  |  |  | | --- | --- | --- | |  | a. | reproduce. | |  | b. | form chemical bonds. | |  | c. | sense and respond to stimuli. | |  | d. | maintain homeostasis. | |  | e. | decompose. |  |  |  | | --- | --- | | *ANSWER:* | a, c, d | |

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| 73. Functional traits of a living organisms include:   |  |  |  | | --- | --- | --- | |  | a. | growing and reproducing. | |  | b. | moving from place to place. | |  | c. | responding to their environment. | |  | d. | obtaining and using energy. | |  | e. | maintaining a stable internal environment. |  |  |  | | --- | --- | | *ANSWER:* | a, c, d, e | |

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| 74. The nucleus of an atom contains atomic particles called \_\_\_\_\_ and \_\_\_\_\_.   |  |  |  | | --- | --- | --- | |  | a. | protons | |  | b. | electrons | |  | c. | atoms | |  | d. | neutrons | |  | e. | orbitals |  |  |  | | --- | --- | | *ANSWER:* | a, d | |

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| 75. Atoms are made up of:   |  |  |  | | --- | --- | --- | |  | a. | negatively charged neutrons. | |  | b. | negatively charged electrons. | |  | c. | positively charged protons. | |  | d. | negatively charged protons. | |  | e. | neutral neutrons. |  |  |  | | --- | --- | | *ANSWER:* | b, c, e | |

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| 76. For an element to have no charge, which particles must be equal in number?   |  |  |  | | --- | --- | --- | |  | a. | subatomic particles | |  | b. | subatomic particles | |  | c. | electrons | |  | d. | neutrons | |  | e. | protons |  |  |  | | --- | --- | | *ANSWER:* | c, e | |

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| 77. In addition to carbon, hydrogen, oxygen, and nitrogen, which elements make up the bulk of the human body?   |  |  |  | | --- | --- | --- | |  | a. | potassium | |  | b. | phosphorus | |  | c. | sodium | |  | d. | calcium | |  | e. | water |  |  |  | | --- | --- | | *ANSWER:* | b, d | |

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| 78. Organic molecules are defined as having:   |  |  |  | | --- | --- | --- | |  | a. | a carbon backbone. | |  | b. | at least one carbon–oxygen bond. | |  | c. | at least one carbon–hydrogen bond. | |  | d. | two or more carbon–nitrogen bonds. | |  | e. | more than one carbon–sulfur bond. |  |  |  | | --- | --- | | *ANSWER:* | a, c | |

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| 79. Nucleotides are composed of:   |  |  |  | | --- | --- | --- | |  | a. | sugar. | |  | b. | a phosphate group. | |  | c. | lipids. | |  | d. | amino acids. | |  | e. | a base. |  |  |  | | --- | --- | | *ANSWER:* | a, b, e | |

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| 80. Energy-storing polymers include:   |  |  |  | | --- | --- | --- | |  | a. | carbohydrates. | |  | b. | water. | |  | c. | nucleic acid. | |  | d. | lipids. | |  | e. | proteins. |  |  |  | | --- | --- | | *ANSWER:* | a, d | |

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| 81. Lipids may function in all of the following ways:   |  |  |  | | --- | --- | --- | |  | a. | as hormones. | |  | b. | for energy storage. | |  | c. | as components of cell membranes. | |  | d. | for structural support. | |  | e. | as insulation. |  |  |  | | --- | --- | | *ANSWER:* | a, b, c, e | |

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| 82. Which statements describe the functions of proteins?   |  |  |  | | --- | --- | --- | |  | a. | They help speed up chemical reactions. | |  | b. | Their function is dependent on their shape. | |  | c. | They serve as energy-storage molecules. | |  | d. | They help move things around inside of cells. | |  | e. | They contain peptide bonds. |  |  |  | | --- | --- | | *ANSWER:* | a, b, d, e | |

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| 83. Cell membranes are made up of:   |  |  |  | | --- | --- | --- | |  | a. | phospholipids. | |  | b. | phosphates. | |  | c. | potassium. | |  | d. | phosphorus. | |  | e. | proteins. |  |  |  | | --- | --- | | *ANSWER:* | a, e | |

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| 84. Which statements describe the characteristics of phospholipids?   |  |  |  | | --- | --- | --- | |  | a. | They are the primary components of cell membranes. | |  | b. | Part of the molecule is hydrophobic. | |  | c. | The tails of the molecule are hydrophilic. | |  | d. | They form a bilayer when placed in water. | |  | e. | The tails congregate in the middle. |  |  |  | | --- | --- | | *ANSWER:* | a, b, d, e | |

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| 85. Which statements describe the characteristics of water?   |  |  |  | | --- | --- | --- | |  | a. | Neighboring molecules are held together by carbon–carbon bonds. | |  | b. | It is less dense as a solid than as a liquid. | |  | c. | It is the basis for all life as we know it. | |  | d. | It is a polarized molecule, where the oxygen is slightly positive and the hydrogens are slightly negative. | |  | e. | It can dissolve molecules with electrical charges. |  |  |  | | --- | --- | | *ANSWER:* | b, c, e | |

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| 86. What protects a cell from the environment?   |  |  |  | | --- | --- | --- | |  | a. | hydrophilic tails and hydrophobic heads of phospholipids | |  | b. | a phospholipid bilayer | |  | c. | a semipermeable phospholipid barrier | |  | d. | the cell membrane | |  | e. | glycoproteins |  |  |  | | --- | --- | | *ANSWER:* | b, c, d | |

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| 87. The properties of water include that water molecules:   |  |  |  | | --- | --- | --- | |  | a. | are capable of dissolving all biological materials. | |  | b. | adhere to charged surfaces. | |  | c. | are cohesive to other water molecules. | |  | d. | are polar due to unequal sharing of electrons. | |  | e. | form liquid water at 4°C. |  |  |  | | --- | --- | | *ANSWER:* | b, c, d, e | |

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| 88. A solution that has a high number of free H+ ions is considered a(n) \_\_\_\_\_ solution, whereas a solution with a high amount of free OH− ions is consdered a(n) \_\_\_\_\_ solution.   |  |  |  | | --- | --- | --- | |  | a. | acidic | |  | b. | water | |  | c. | neutral | |  | d. | basic | |  | e. | blood |  |  |  | | --- | --- | | *ANSWER:* | a, d | |

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| 89. Some recent nutrition science research studies have shown that individuals who eat a low-acid diet exhibit improved bone health and decreased risk of diabetes and heart disease. Some common substances that might be reduced or eliminated by someone transitioning to a low-acid diet include:   |  |  |  | | --- | --- | --- | |  | a. | coffee | |  | b. | citrus juices | |  | c. | water | |  | d. | most vegetables | |  | e. | soda/pop |  |  |  | | --- | --- | | *ANSWER:* | a, b, e | |

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| 90. Exploring life on Mars, or any unknown environment, poses interesting and exciting opportunities for biologists to understand if life exists. When assessing new environments, biologists look for specific characteristics in defining something as “alive.” To classify something as living, an organism must be able to \_\_\_\_\_.   |  |  | | --- | --- | | *ANSWER:* | grow; reproduce; maintain homeostasis; sense and respond to stimuli; and obtain and use energy | |

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| 91. Whether or not viruses are alive is frequently debated. Name one characteristic of viruses that makes them similar to other living organisms and one characteristic that challenges our understanding of life.   |  |  | | --- | --- | | *ANSWER:* | Viruses seem alive because they can reproduce, but they can only do so once they have infected other cells; they can’t reproduce on their own. | |

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| 92. Viruses contain genetic material. They can make copies of themselves, but only by using the services of a living host cell. Viruses are assembled in their final form and size by the host cell. Viruses use the host cell’s energy mechanisms; they lack any of their own. Is a virus alive? Support your answer.   |  |  | | --- | --- | | *ANSWER:* | No, a virus is not alive. A living cell can accomplish all of the above-stated tasks by itself, but a virus must use another cell to make copies of itself. It uses the other cell’s metabolism, and it does not grow and develop on its own. Instead, it is assembled in its final form. Just because viruses contain genetic material does not make them alive. | |

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| 93. The four elements that make up most of your body are \_\_\_\_\_.   |  |  | | --- | --- | | *ANSWER:* | carbon, hydrogen, oxygen, and nitrogen | |

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| 94. The six most abundant elements in the human body, listed from most common to least common (highest percentage to lowest percentage), are \_\_\_\_\_.   |  |  | | --- | --- | | *ANSWER:* | oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus | |

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| 95. Why is CO2 classified as an inorganic molecule and not as an organic molecule?   |  |  | | --- | --- | | *ANSWER:* | CO2 does not have a carbon–carbon backbone and a carbon–hydrogen bond. | |

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| 96. Explain the difference between organic and inorganic molecules.   |  |  | | --- | --- | | *ANSWER:* | An organic molecule has a carbon backbone and at least one carbon-hydrogen bond. An inorganic molecule may have one of these, but not both. | |

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| 97. What are the four categories of organic macromolecules found in living organisms?   |  |  | | --- | --- | | *ANSWER:* | carbohydrates, lipids, proteins, and nucleic acids | |

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| 98. What structural motif is shared among complex carbohydrates, DNA, and proteins?   |  |  | | --- | --- | | *ANSWER:* | All are organic molecules made of polymers. Complex carbohydrates are polymers of monosaccharides, DNA is a polymer of individual nucleic acids, and proteins are polymers of individual amino acids. | |

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| 99. Match up each category of macromolecule with the correct example.  ​   |  |  | | --- | --- | | A. Carbohydrates | a. Cholesterol or fat | | B. Proteins | b. DNA or RNA | | C. Lipids | c. Hemoglobin or enzyme | | D. Nucleic acids | d. Glycogen or starch |   ​   |  |  | | --- | --- | | *ANSWER:* | A d; B c; C a; D b | |

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| 100. Match up each macromolecule with the correct example of its function.  ​   |  |  | | --- | --- | | A. Carbohydrates | a. Genetic material | | B. Proteins | b. Speed up chemical reactions | | C. Lipids | c. Insulation | | D. Nucleic acids | d. Energy storage |   ​  ​   |  |  | | --- | --- | | *ANSWER:* | A. d; B. b; C. c; D. a | |

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| 101. Label each of the following as either a monomer (M) or a polymer (P).  \_\_\_\_\_ monosaccharide  \_\_\_\_\_ protein  \_\_\_\_\_ lipid  \_\_\_\_\_ amino acid  \_\_\_\_\_ nucleic acid  \_\_\_\_\_ carbohydrate   |  |  | | --- | --- | | *ANSWER:* | M, P, P, M, P, P | |

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| 102. Describe what happens when phospholipids are put into water. How do they arrange themselves?   |  |  | | --- | --- | | *ANSWER:* | Phospholipids arrange themselves in a bilayer with the hydrophobic tails on the inside (protected from water), and the hydrophilic heads arrange themselves on the outside (next to water). | |

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| 103. Why do phospholipids form bilayers in water?   |  |  | | --- | --- | | *ANSWER:* | The “head” that contains the phosphate group is hydrophilic, and the two tails are hydrophobic. By forming a bilayer, the tails of both sides can be isolated from the water. | |

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| 104. Which part of the cell membrane is a barrier to the movement of water into or out of the cell?   |  |  | | --- | --- | | *ANSWER:* | the hydrophobic tails that make up the center of the membrane | |

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| 105. Why doesn’t oil dissolve in water?   |  |  | | --- | --- | | *ANSWER:* | Water only dissolves molecules with charges or that are polar; therefore, oil is electrically neutral and nonpolar. -OR- Oil is hydrophobic. | |

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| 106. What physical feature makes a water molecule polar?   |  |  | | --- | --- | | *ANSWER:* | The electrons are more attracted to the nucleus of the oxygen atom because it is so much larger and more positive. Therefore, they spend more of their time near the oxygen, making that have a net negative charge, and making the region of the hydrogen atoms have a net positive charge. | |

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| 107. Water is sometimes called the “universal solvent” because so many things dissolve in it. Why is this term misleading? Use specific examples.   |  |  | | --- | --- | | *ANSWER:* | Hydrophobic molecules do not dissolve in water, so it is not a “universal” solvent. The hydrophobic tails of phospholipids do not dissolve in water, nor do hydrocarbons such as oil or gasoline. | |

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| 108. Why can a water strider walk across the surface of a pond, or why can you skip a flat stone across a pond?   |  |  | | --- | --- | | *ANSWER:* | Water molecules are attracted to other water molecules because of their polarity. Their hydrogen-bonding to each other creates surface tension on the body of water. This is called cohesion. | |

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| 109. Why does rain fall in drops containing many water molecules, instead of individual molecules?   |  |  | | --- | --- | | *ANSWER:* | Water molecules are attracted to other water molecules because of their polarity. This is called cohesion. | |

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| 110. Why does ice float on water?   |  |  | | --- | --- | | *ANSWER:* | Water molecules become less densely packed when they freeze, so that they float on top of the more densely packed liquid water molecules. | |

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| 111. Why do frozen water pipes break?   |  |  | | --- | --- | | *ANSWER:* | Frozen water pipes break because water is less dense as a solid than as a liquid. Thus, liquid water takes up less space than ice. When liquid water inside a pipe freezes, it expands and can break the pipe. | |

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| 112. Why do cities add salt to their roads either before or after an ice storm? What does the salt do?   |  |  | | --- | --- | | *ANSWER:* | Salt lowers the freezing temperature of water, and thus limits ice formation or melts ice on roads. | |

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| 113. If you add salt to water, how does that affect the freezing point?   |  |  | | --- | --- | | *ANSWER:* | It can lower it to as low as −50°F. | |

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| 114. The pH scale goes from \_\_\_\_\_ to\_\_\_\_\_. A pH of 7 is considered \_\_\_\_\_, a pH <7 is considered \_\_\_\_\_, and a pH>7 is considered \_\_\_\_\_.  ​  ​   |  |  | | --- | --- | | *ANSWER:* | 0; 14; neutral; acidic; basic | |

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| 115. Solution A has 100,000,000 free H+ ions/liter.  Solution B has 1,000,000 free H+ ions/liter.  Solution C has 200,000,000 free H+ ions/liter.  Solution D has 2,000,000 free H+ ions/liter.  Which solution is the weakest acid, and which solution has the lowest pH?   |  |  | | --- | --- | | *ANSWER:* | Solution B is the weakest acid (strongest base), and Solution C has the lowest pH. | |

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| 116. Solution A has 100,000,000 free H+ ions/liter.  Solution B has 1,000,000 free H+ ions/liter.  Solution C has 200,000,000 free H+ ions/liter.  Solution D has 2,000,000 free H+ ions/liter.  Which solution is the strongest acid, and which solution has the highest pH?   |  |  | | --- | --- | | *ANSWER:* | Solution C is the strongest acid, and Solution B has the highest pH. | |

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| 117. Which is worse for you to spill on your hands, a strong acid or a strong base?   |  |  | | --- | --- | | *ANSWER:* | They are both equally bad. Living systems function near pH 7. The further you get from pH 7, the more cellular damage would occur because of the reactivity of the acids and bases. Drano (pH 14) and battery acid (pH 0) are both damaging—both will dissolve proteins. | |

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| 118. Some recent nutrition science research studies have shown that individuals who eat a low-acid diet exhibit improved bone health and decreased risk of diabetes and heart disease. What would be some foods or drinks that an individual might want to reduce or eliminate in order to eat a lower-acid diet?   |  |  | | --- | --- | | *ANSWER:* | Foods such as citrus fruits and tomatoes, and drinks such as coffee, citrus juices, and diet and regular sodas should be eliminated. | |

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| 119. When experiencing “acid reflux” or “heartburn,” meaning a small amount of acid from the stomach flows back toward the esophagus (the tube connecting the mouth to the stomach), many people will elect to take antacids to try reduce the “burning” sensation. What is in antacids that allow them to reduce or eliminate the burning sensation?   |  |  | | --- | --- | | *ANSWER:* | Antacids contain basic substances such as OH− to neutralize, or bind, the excess H+ that is causing the acid reflux or “heartburn.” | |

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| 120. According to scientists, which form (state of matter) of water is required for the presence of life?   |  |  | | --- | --- | | *ANSWER:* | liquid | |