Exam
Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The subatomic particles that play the greatest role in cellular chemical reactions are: 1) _____
A) electrons. B) isotopes. C) neutrons. D) protons.

2) The mass within an atom comes from: 2) _____
A) electrons only.
B) protons, neutrons, and electrons.
C) protons only.
D) protons and neutrons.

3) The subatomic particles with the most mass are: 3) _____
A) protons. B) electrons.
C) neutrons. D) both A and C

4) An atom whose atomic number is 10 has how many electrons in its outermost energy level? 4) _____
A) three B) two C) eight D) ten E) five

5) If the atomic number is 18, then: 5) _____
A) this atom would be considered reactive.
B) there are seven electrons in the outermost shell.
C) the outermost energy level is full.
D) the atom has 18 electrons in the nucleus.

6) Isotopes are atoms of the same element that differ in their: 6) _____
A) number of protons. B) number of electrons.
C) ionic charge. D) number of neutrons.

7) The mass of matter is proportional to the: 7) _____
A) volume of matter.
B) number of protons.
C) number of electrons.
D) weight of matter.
E) density of matter.

8) Which of the following is *not* a component of atoms? 8) _____
A) molecules B) electrons
C) neutrons D) protons

9) Which of the following are found in the nucleus of an atom? 9) _____
A) protons
B) neutrons
C) electrons
D) A and B
E) A, B, and C

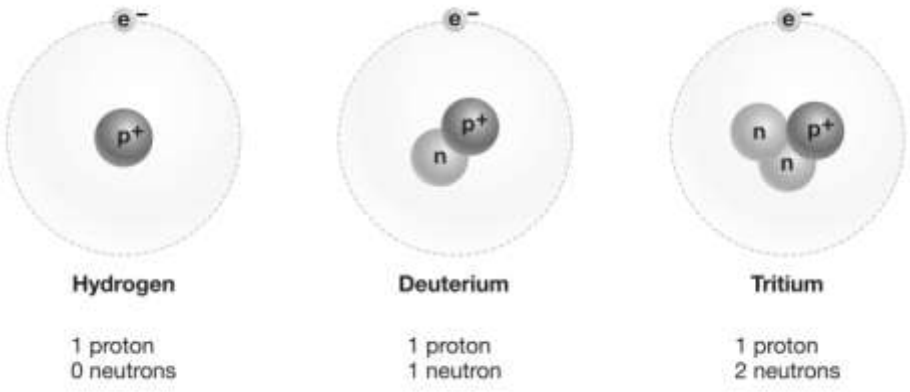
10) An element with 22 protons, 22 neutrons, and 22 electrons would have an atomic

number of: 10) ___
___

A) 11. B) 22. C) 44. D) 66.

11) Isotopes have been used to: 11) _____
A) determine the age of fossils.
B) detect bone cancer.
C) create new elements.
D) A and B
E) A, B, and C

12) Chlorine has an atomic number of 17, and argon has an atomic number of 18. From this information alone, you can predict that: 12) _____
A) chlorine has more neutrons than argon.
B) chlorine is more chemically reactive than argon.
C) argon is more chemically reactive than chlorine.
D) argon has more neutrons than chlorine.
E) argon will more readily ionize than chlorine.



Refer to the figure above and then answer the question that follows.

13) Consider carbon-12, carbon-13, and carbon-14 (the numbers indicate atomic mass). Which of these forms of carbon is an isotope? 13) _____
A) carbon-13
B) carbon-12
C) carbon-14
D) None are isotopes.
E) All are isotopes.

14) What is it about carbon-12, carbon-13, and carbon-14 that makes them all carbon? 14) _____
A) They all have the number of neutrons that is characteristic of carbon.
B) They all have the number of protons that is characteristic of carbon.
C) They all have the number of protons plus neutrons that is characteristic of carbon.
D) All are radioactive.
E) All are elements.

15) You have a substance and begin a set of experiments in which you break it down into other substances through chemical reactions. After a few successive reactions, you discover a set of products that can't be broken down further, no matter what type of chemical reaction you attempt. These substances are: 15) _____
A) electrons.
B) elements.
C) protons.
D) isotopes.
E) neutrons.

16) The component of an atom or molecule that is most important in determining its chemical bonding properties is the: 16) _____
A) nucleus.
B) electron.
C) proton.
D) neutron.
E) isotope.

17) Which of the following results from the making of a bond? 17) _____
A) Electrons are destroyed.
B) Molecules are broken down.
C) Atoms become more stable.
D) Atoms become more reactive.

18) For an atom to be considered an ion: 18) _____
A) neutrons can outnumber protons,
B) protons can outnumber neutrons.
C) protons can outnumber electrons.
D) protons equal electrons.

19) Which type of bonding occurs between molecules and not within molecules? 19) _____
A) hydrogen
B) polar covalent
C) covalent
D) ionic

20) When an electron passes from one atom to another: 20) _____
A) attraction occurs between two atoms based on opposite charges.
B) the identity of the atom changes.
C) a proton is also lost from the nucleus.
D) the electron travels in orbitals around both the donor and recipient atom.

21) An atom will react with other atoms only until: 21) _____
A) all of its outermost orbitals have been filled.
B) it has achieved maximum stability.
C) it has completely filled its outermost energy level.
D) All of the above are true.

22) The naturally occurring helium atom is chemically inert because: 22) _____
A) it has all of the shared electrons it could ever have.
B) its outermost shell is filled with electrons.

C) it has the most protons that it could ever carry.
D) its nucleus is filled with two neutrons.

23) An atom becomes an ion when: 23) _____
A) hydrogen ions are shared.
B) it gains or loses neutrons.
C) it gains or loses electrons.
D) it forms a covalent bond.
E) it gains or loses protons.

24) Sodium chloride (NaCl) crystals (table salt) form as a result of: 24) _____
A) chemical unreactivity.
B) the attraction of oppositely charged particles for each other.
C) covalent bonding.
D) the lack of chemical attraction.

25) Hydrogen bonds are very important in the functional shape of: 25) _____
A) proteins.
B) sugars.
C) fats.
D) nucleic acids.
E) Both A and D are true.

26) Nonpolar molecules develop when: 26) _____
A) one atom is much more electronegative than the other.
B) electrons transfer from one atom to another.
C) both atoms have similar electronegativity.
D) shared electrons are not shared equally.

27) The symbol $3CO_2$ represents: 27) _____
A) three carbon atoms and one molecule of oxygen.
B) one atom of carbon and three atoms of oxygen.
C) three molecules of carbon dioxide.
D) one atom of oxygen and three of carbon.

28) In a bottle of water, hydrogen bonding occurs between the hydrogen of one atom and: 28) _____
A) an oxygen atom in a different molecule.
B) a hydrogen atom in a different molecule.
C) an oxygen atom in the same water molecule.
D) a hydrogen atom in the same molecule.

29) Which of the following is *not* a compound? 29) _____
A) methane
B) a protein
C) nitrogen
D) glucose
E) table salt

30) When atoms form bonds, they share or exchange: 30) _____
A) electrons.
B) neutrons.

C) protons.
D) A and B
E) A, B, and C

31) Which of the following is true of chemical bonds? 31) _____
A) They cannot occur between two identical atoms.
B) One atom can give up a proton to another to form bonds.
C) Atoms can achieve a higher energy state and less stability by forming bonds.
D) Two atoms can share an electron unequally, with one drawing it more toward itself.

32) Atoms form bonds to: 32) _____
A) fill their outer shells with electrons.
B) obtain an equal number or protons and electrons.
C) fill their outer shells with neutrons.
D) obtain an equal number of protons and neutrons.
E) fill their outer shells with protons.

33) Two hydrogen atoms (atomic number 1) form a covalent bond. Which of the following is true? 33) _____
A) Both hydrogen atoms now have two protons in their outer shell.
B) Both hydrogen atoms now have two electrons in their outer shell.
C) One hydrogen atom now has zero protons in its outer shell, and the other has two.
D) Each hydrogen atom still has one electron in its outer shell.
E) One hydrogen atom now has zero electrons in its outer shell, and the other has two.

34) Oxygen has six electrons in its second outer shell. How many covalent bonds is oxygen likely to make with hydrogen, which has one electron in its first outer shell? 34) _____
A) one B) eight C) two D) three E) six

35) Which of the following would form the fewest covalent bonds? 35) _____
A) hydrogen (one electron it the first shell)
B) neon (eight electrons in the second shell)
C) oxygen (six electrons in the second shell)
D) carbon (four electrons in the second shell)

36) Water is a polar molecule because: 36) _____
A) oxygen has more electrons than hydrogen.
B) oxygen has more neutrons than hydrogen.
C) hydrogen has more neutrons than oxygen.
D) hydrogen is more electronegative than oxygen.
E) oxygen is more electronegative than hydrogen.

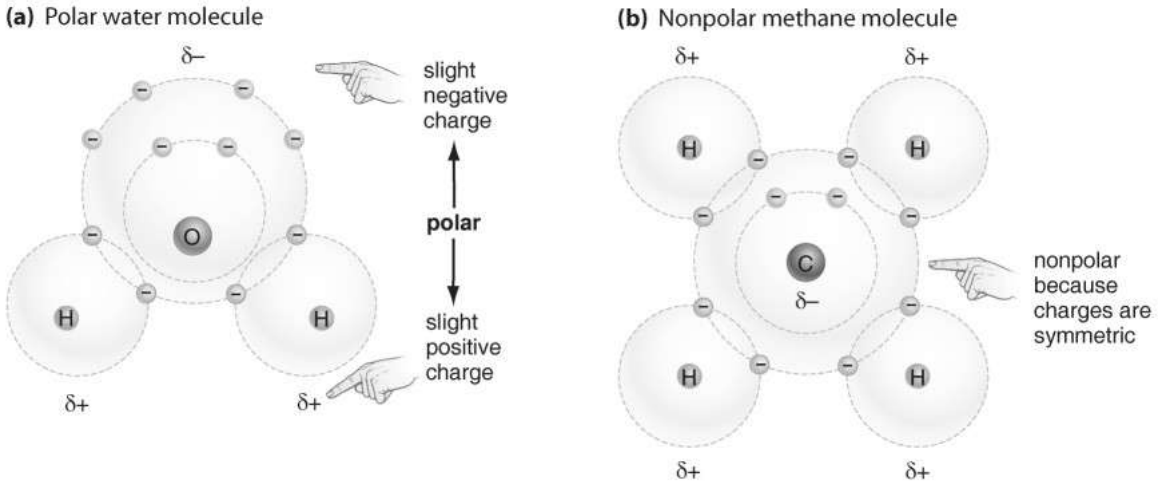
37) H_2S is an example of a: 37) _____
A) structural formula.
B) space-filling model.
C) ball-and-stick formula.
D) molecular formula.

E) none of the above

38) Covalent bonds form when one atom _____ its _____ with another atom. 38) _____
A) gives up; electrons
B) gives up; protons
C) gives up; neutrons
D) shares; electrons
E) shares; protons

39) Potassium has one electron in its fourth shell, and chloride has seven electrons in its third shell. Which of the following is most likely to be true? 39) _____
A) The two atoms will share the electron unequally in a polar bond.
B) The two atoms will share an electron equally in a covalent nonpolar bond.
C) Potassium will give an electron to chloride to form an ionic bond.
D) Chloride will give an electron to potassium to form an ionic bond.

40) Nitrogen has seven protons, and hydrogen has one proton. Based on your knowledge of the rules of covalent bonding, which of the following molecules will form from the reaction of nitrogen and hydrogen? 40) _____
A) NH_3 B) NH C) NH_4 D) NH_2 E) NH_5



Refer to the figure above and then answer the question that follows.

41) Which of the following molecules is most likely to bind to an ion, and why? 41) _____
A) Molecule B, because it has a carbon at in the center of the molecule.
B) Molecule A, because it has electrical charges that will attract an ion.
C) Molecule B, because it has four hydrogen atoms on the exterior of the molecule.
D) Molecule A, because any molecule with oxygen is able to bind to an ion.

42) In what ways are hydrogen bonds and ionic bonds similar? 42) _____
A) Both are based on attraction between two atoms that each carry a

negative charge.

B) Both are based on attraction between two atoms that each carry a positive charge.
C) Both are based on repulsion between atoms that carry differences in electrical charge.
D) Both involve an even sharing of electrons between atoms.
E) Both are based on attraction between atoms that carry differences in electrical charge.

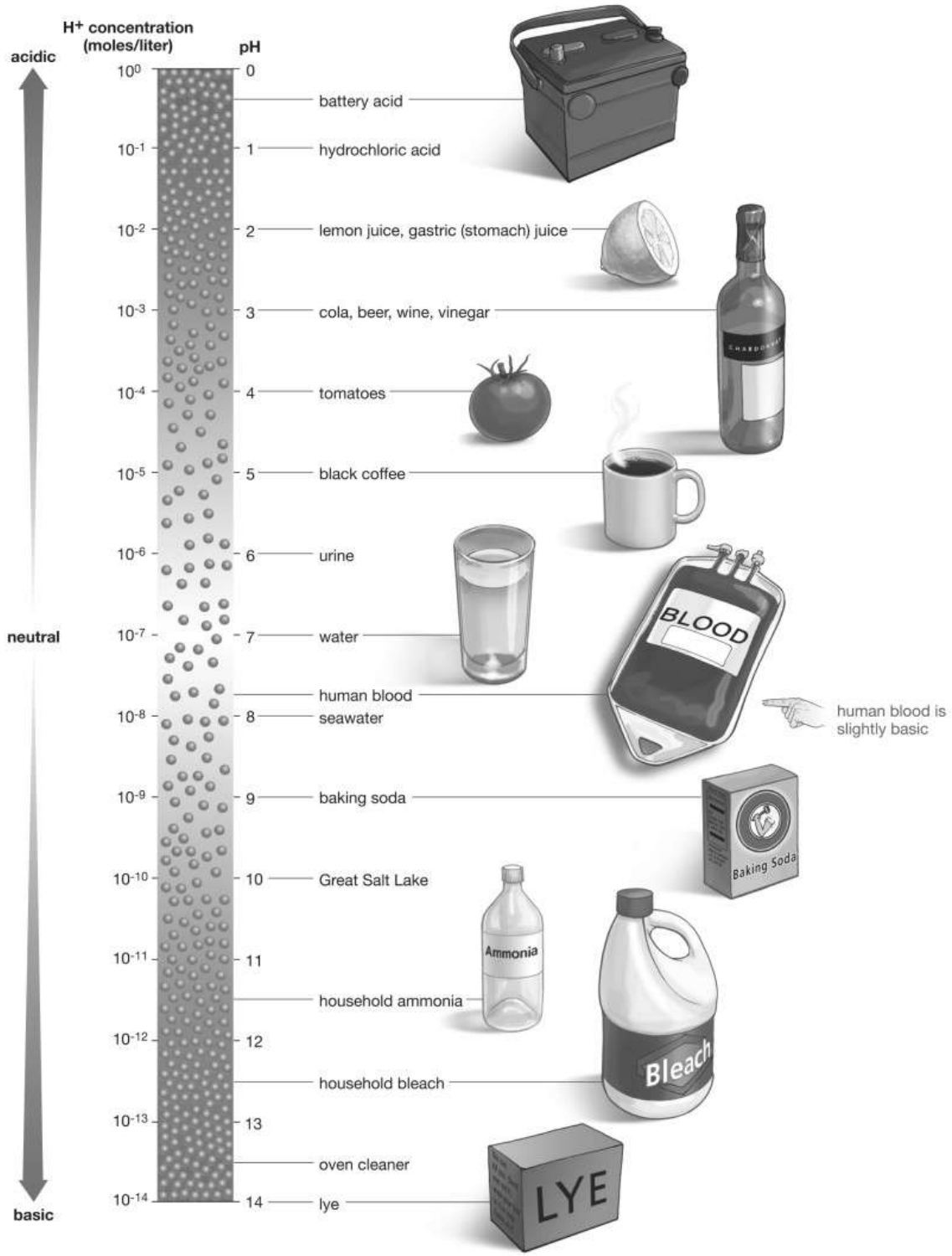
43) If an atom has an atomic number of 11, which of the electron shells are filled? 43) _____
A) the first shell
B) the first, second, third, and fourth shell
C) the first, second, and third shell
D) the first and second shell

44) Enzymes are proteins that catalyze specific reactions within a cell. For catalysis to occur, they require a starting substance to bind directly to the enzyme. What must be true for this binding to happen correctly? 44) _____
A) Both the enzyme and the starting substance must be hydrophilic.
B) The starting substance must be larger than the enzyme.
C) Both the enzyme and the starting substance need to have matching shapes.
D) The enzyme must be acidic, and the starting substance must be basic.

45) When you put sugar into your morning coffee or tea, the sugar is the _____, and the tea or coffee is the _____. 45) _____
A) solution, solute
B) solute, solvent
C) solvent, solution
D) solute, solution
E) solvent, solute

46) Hydrophobic molecules tend to be _____ by water. 46) _____
A) repelled B) absorbed C) attracted D) mixed

47) You mix sugar in water and stir until it's completely dissolved. In this system, the water is the _____, the sugar is the _____, and the end result is a _____. 47) _____
A) solution; solvent; solute
B) solvent; solution; solute
C) solute; solvent; solution
D) solvent; solute; solution
E) solute; solution; solvent



Refer to the figure above and then answer the question that follows.

48) You are working in a chemistry lab, and your lab partner knocks over a beaker of hydrochloric acid. You alert your laboratory instructor, and he immediately pours another solution over the spill to neutralize the acid. What did he pour onto the acid to neutralize it? 48) _____

A) lemon juice
B) sodium hydroxide
C) a buffer at pH 3
D) water

49) As an acid mixes in water: 49) _____
A) The solution will cool down.
B) the number of hydrogen ions will increase.
C) The pH remains at 7.
D) the number of hydroxide ions will increase.

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

50) Chemical reactions that occur within living things change the nucleus of atoms. 50) _____

51) An atom always contains the same number of protons as neutrons. 51) _____

52) Neutrons are negatively charged. 52) _____

53) Protons move at very fast speeds around the outside of the nucleus of an atom. 53) _____

54) Anything that occupies space is energy. 54) _____

55) An element can't be broken down into another form of pure matter. 55) _____

56) The number of neutrons in the nucleus of an atom gives it a unique chemical nature. 56) _____

57) Isotopes differ from each other in the number of protons that they possess. 57) _____

58) Atoms are electrically neutral. 58) _____

59) The electrons of an atom contribute significantly to the mass of an atom. 59) _____

60) Ionic bonds occur through a sharing of electrons. 60) _____

61) Acids release hydrogen ions into aqueous solutions. 61) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

62) _____ orbit around the nucleus of an atom. 62) _____

63) A single covalent chemical bond represents a sharing of _____ electrons between two atoms. 63) _____

64) Hydrogen bonds may form between oxygen of one water molecule and _____ of another water molecule. 64) _____

65) Cigarette smoking and exposure to sunlight _____ the production of free radicals by our bodies. 65) _____

66) A signal will _____ to a receptor if the molecules shape match, similar to a key in a lock. 66) _____

67) Water molecules are uncharged and _____. 67) _____

68) A(n) _____ has a higher pH than a(n) _____. 68) _____

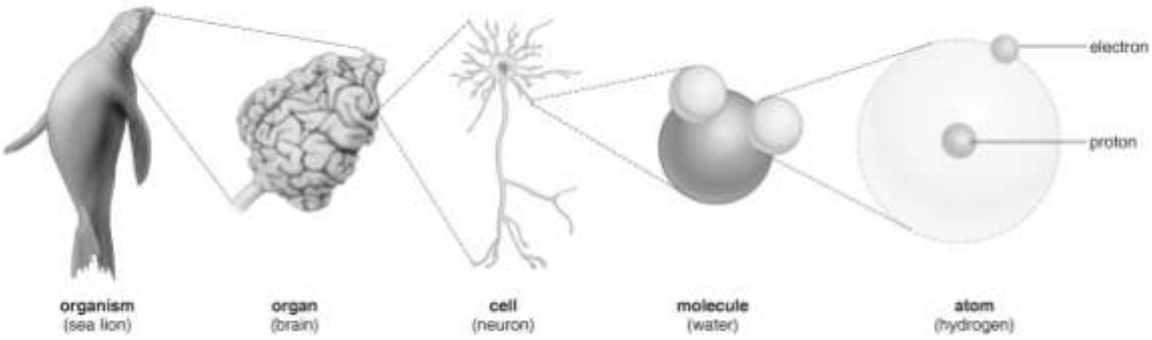
MATCHING. Choose the item in column 2 that best matches each item in column 1.
Match column 1 with the items in column 2.

69) proton	A) positive charge	69) _____
70) neutrons	B) ionic bond	70) _____
71) electrons	C) no charge	71) _____
72) Results from electrons being transferred between atoms	D) hydrogen bond	72) _____
	E) nonpolar covalent bond	
73) Results from an unequal sharing of shared electrons		73) _____
	F) negative charge	
74) Explains the attraction of water molecules for each other	G) electron-proton interaction	74) _____
	H) polar covalent bond	
75) Would be the least affected by the presence of water		75) _____
76) Keeps most electrons from escaping the nucleus of an atom		76) _____

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

77) What are the four most important types of elements necessary for life on this planet?

78) What are the three most important subatomic particles in an atom called? Which one is involved in forming chemical bonds?



Refer to the figure above and then answer the question that follows.

79) Describe at which level life begins.

80) What is chemical bonding? Explain the differences between covalent and ionic bonding.

81) Explain how a polar molecule, such as water, has a charge imbalance but is also electrically neutral.

82) How are ions formed? Why do ionic compounds readily dissolve in water?

1) A
2) D
3) D
4) C
5) C
6) D
7) D
8) A
9) D
10) B
11) D
12) B
13) E
14) B
15) B
16) B
17) C
18) C
19) D
20) B
21) D
22) B
23) C
24) B
25) E
26) B
27) C
28) A
29) C
30) A
31) D
32) A
33) B
34) C
35) B
36) E
37) D
38) D
39) C
40) A
41) B
42) E
43) D
44) C
45) B
46) A
47) D
48) B
49) B
50) FALSE
51) FALSE

52) FALSE
53) FALSE
54) FALSE
55) TRUE
56) FALSE
57) FALSE
58) TRUE
59) FALSE
60) FALSE
61) TRUE
62) Electrons
63) two
64) hydrogen
65) increase
66) bind
67) polar
68) base, acid

69) A
70) C
71) F
72) B
73) H
74) D
75) E
76) G
77) carbon, oxygen, nitrogen, and hydrogen
78) Protons, neutrons, and electrons are the three most important subatomic particles. Only electrons are involved in chemical bonding.
79) Everything that is below the level of the cell is nonliving. Atoms make up molecules, and molecules are necessary for life, but neither atoms nor molecules are themselves living.
80) Atoms react if they need electrons to complete their outer orbitals. Covalent bonding

results from sharing of electrons between two atoms, whereas ionic bonding results when one atom transfers electrons to the other atom.

81) Because the electronegativity of oxygen and hydrogen is so different, oxygen keeps shared electrons more around its nucleus than does the hydrogen in water, creating an electrical imbalance. Because each atom of the water molecule at some time has its outermost energy level full, the water molecule is electrically neutral.

82) Ions are formed when one atom completely transfers one or more electrons to another atom. Because ionic compounds are made up of oppositely charged ions, water molecules readily dissociate them from each other, dissolving the ionic compound.