Chapter 8 Quiz

Name: Solutions Date: _____

Matching *Match each item with the correct statement below.* (9 pts)

a. coordinate covalent bond
b. double covalent bond
c. structural formula
d. network solid
e. bonding orbital
f. dipole interaction
g. bond dissociation energy
h. single covalent bond
i. polar bond
j. hydrogen bond

c 1. a depiction of the arrangement of atoms in molecules and polyatomic ions

h 2. a covalent bond in which only one pair of electrons is shared

b 3. a covalent bond in which two pairs of electrons are shared

a 4. a covalent bond in which the shared electron pair comes from only one of the atoms

i 5. a covalent bond between two atoms of significantly different electronegativities

j 6. a type of bond that is very important in determining the properties of water and of important biological molecules such as proteins and DNA

g 7. energy needed to break a single bond between two covalently bonded atoms

f 8. attraction between polar molecules

d 9. crystal in which all the atoms are covalently bonded to each other

Multiple Choice
Identify the choice that best completes the statement or answers the question. (20 pts)

d 1. Which is a typical characteristic of an ionic compound?
a. Electron pairs are shared among atoms.
b. The ionic compound has a low solubility in water.
c. The ionic compound is described as a molecule.
d. The ionic compound has a high melting point.

a 2. What is shown by the structural formula of a molecule or polyatomic ion?
a. the arrangement of bonded atoms
b. the number of ionic bonds
c. the number of metallic bonds
d. the shapes of molecular orbitals

a 3. Which of these elements does not exist as a diatomic molecule?
a. Ne
b. F
c. H
d. I

c 4. How do atoms achieve noble-gas electron configurations in single covalent bonds?
a. One atom completely loses two electrons to the other atom in the bond.
b. Two atoms share two pairs of electrons.
c. Two atoms share two electrons.
d. Two atoms share one electron.

b 5. Why do atoms share electrons in covalent bonds?
a. to become ions and attract each other
b. to attain a noble-gas electron configuration
c. to become more polar
d. to increase their atomic numbers

d 6. Which of the following elements can form diatomic molecules held together by triple covalent bonds?
a. carbon
b. oxygen
c. fluorine
d. Nitrogen

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d 7. Which elements can form diatomic molecules joined by a single covalent bond?
a. hydrogen only
b. halogens only
c. halogens and members of the oxygen group only
(d) hydrogen and the halogens only

a 8. Which of the following diatomic molecules is joined by a double covalent bond?
(a) O_2 c. N_2
b. Cl_2 d. He_2

b 9. A molecule with a single covalent bond is ____.
a. CO_2 c. CO
(b) Cl_2 d. N_2

c 10. When one atom contributes both bonding electrons in a single covalent bond, the bond is called a(n) ____.
a. one-sided covalent bond (c) coordinate covalent bond
b. unequal covalent bond d. ionic covalent bond

a 11. When H^+ forms a bond with H_2O to form the hydronium ion H_3O^+, this bond is called a coordinate covalent bond because ____.
(a) both bonding electrons come from the oxygen atom
b. it forms an especially strong bond
c. the electrons are equally shared
d. the oxygen no longer has eight valence electrons

d 12. How many valid electron dot formulas—having the same number of electron pairs for a molecule or ion—can be written when a resonance structure occurs?
a. 0 c. 2 only
b. 1 only (d) 2 or more

d 13. In which of the following compounds is the octet expanded to include 12 electrons?
a. H_2S c. PCl_5
b. PCl_3 (d) SF_6

c 14. Which of the following atoms acquires the most negative charge in a covalent bond with hydrogen?
a. C (c) O
b. Na d. S

c 15. A bond formed between a silicon atom and an oxygen atom is likely to be ____.
a. ionic (c) polar covalent
b. coordinate covalent d. nonpolar covalent

1.8 - 3.5
1.7

a 16. Which of the following covalent bonds is the most polar?
(a) H—F c. H—H
b. H—C d. H—N

a 17. When placed between oppositely charged metal plates, the region of a water molecule attracted to the negative plate is the ____.
(a) hydrogen region of the molecule c. H—O—H plane of the molecule
b. geometric center of the molecule d. oxygen region of the molecule

b 18. Which of the forces of molecular attraction is the weakest?
a. dipole interaction c. hydrogen bond
(b) dispersion d. single covalent bond

b 19. What causes dipole interactions?
a. sharing of electron pairs
(b) attraction between polar molecules
c. bonding of a covalently bonded hydrogen to an unshared electron pair
d. attraction between ions

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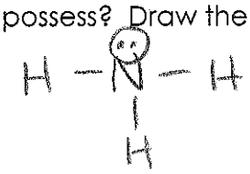
20. Why is hydrogen bonding only possible with hydrogen?
   a) Hydrogen's nucleus is electron deficient when it bonds with an electronegative atom.
   b. Hydrogen is the only atom that is the same size as an oxygen atom.
   c. Hydrogen is the most electronegative element.
   d. Hydrogen tends to form covalent bonds.

Short Answer

1. How many unshared pairs of electrons does the nitrogen atom in ammonia (NH_3) possess? Draw the structural diagram for the molecule. (2 pts)



1 unshared pair of e^-

2. How many covalent bonds are in a covalently bonded molecule containing 1 phosphorus atom and 3 chlorine atoms? Draw the structural diagram for the molecule. (2 pts)

3 single covalent bonds

3. Explain what a polar molecule is. Provide an example. (3 pts)

- difference in electronegativity
- between 2 atoms in a covalent bond
- creates areas of '+' and '-' Ex H_2O

4. Explain the difference between ionic and covalent bonding. (4 pts)

bond - ionic → e^- given from one atom, received by another
covalent → e^- are shared
result - ionic → crystalline structure with ions
covalent → molecules, atoms are combined

Electronegativities for selected elements			
H 2.1	C 2.5	N 3.0	S 2.5
Na 0.9	Si 1.8	O 3.5	F 4.0

Electronegativity Difference and Bond Type	
Electronegativity difference range	Most probable type of bond
0.0 – 0.4	Non-polar covalent
0.4 – 1.0	Moderately polar covalent
1.0 – 2.0	Very polar covalent
≥ 2.0	Ionic