

Chapter 6

Part B Study Guide - Covalent Bonding

Name: _____

Date: _____ Per: _____

A. Covalent Bonds

1. A covalent bond is defined as _____
2. In a triple bond between two atoms, the number of shared electrons is _____
3. A bond in which 2 pairs of electrons are shared is called a _____ bond.
4. In a single bond between two atoms, the number of shared pairs of electrons is _____
5. A bond in which 3 pairs of electrons are shared is called a _____ bond.
6. In a triple bond between two atoms, the number of shared pairs of electrons is _____
7. In a double bond between two atoms, the number of shared electrons is _____
8. A bond in which 1 pair of electrons are shared is called a _____ bond.
9. In a double bond between two atoms, the number of shared pairs of electrons is _____
10. A bond in which 2 electrons are shared is called a _____ bond.
11. In a single bond between two atoms, the number of shared electrons is _____
12. What is the main difference between a covalent bond and an ionic bond? _____
13. What is the difference between an empirical formula and a molecular formula? _____

B. Polarity

14. Rank the following bonded pairs from least polar (1) to most polar (6).
 - a. Cl-F _____
 - b. B-F _____
 - c. P-O _____
 - d. N-Cl _____
 - e. H-N _____
 - f. O-O _____
15. In order for a bond to be considered a polar bond the difference in electronegativity must be _____.
16. In order for a bond to be considered halfway between a polar bond and ionic bond the difference in electronegativity must be _____.
17. In order for a bond to be considered a non-polar bond the difference in electronegativity must be _____.
18. A true non-polar bond occurs between _____.
19. What does the octet rule say? _____
20. How many electrons does hydrogen have when it has a complete octet? _____
21. What are the three exceptions to the octet rule?

C. Lewis Structures

22. In a Lewis structure, there may be no more than _____ dots around an atomic symbol.
23. In the Lewis structure for N, there are _____ paired electrons and _____ bonding sites.
24. How many shared _____ and unshared _____ electrons are present in the Lewis structure of NH_3 ?
25. How many shared pairs of electrons are present in CO_2 ? _____
26. Draw Lewis dot diagrams for each of the following:
 - a. NH_3
 - b. F
 - c. H_2O
 - d. SiO_2
 - e. C_2H_4
 - f. C_2H_2

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D. Naming Substances

Next to each chemical name write the correct empirical formula for each of the following.

27. Diphosphorus tetrachloride _____ 30. Carbon tetrachloride _____
 28. Nitrogen triiodide _____ 31. Oxygen _____
 29. Dinitrogen tetroxide _____

E. Valence Shell Electron Pair Repulsion

32. The VSEPR theory accounts for the _____ of molecules.
 33. Fill in the following chart for C₂H₆.

Molecular Formula	Empirical Formula	Lewis Structure (Structural Formula)	Ball & Stick Model

34. What is the primary benefit of a structural formula? _____
 35. How do a structural formula and a ball & stick model differ? _____
 36. Which pairing represents the greatest valence electron pair repulsion? The least?
 Shared - Shared Unshared – Unshared Unshared – Shared
 _____ _____ _____

37. Fill in the following table: (*Fill in shared & unshared pairs for central atom only*)

Molecular Formula	Lewis Structure (Structural Formula)	Ball & Stick Model	Shape	Bond Angle	Shared Pairs	Unshared Pairs
H ₂				N/A		N/A
CO ₂						
NH ₃						
H ₂ O						
BF ₃						
CCl ₄						

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38. Fill in the following table:

Shape	Bond Angle	Shared Pairs	Unshared Pairs
	<109.5°	1	
	120°		0
		2,3, or 4	0
		2	2
	109.5°		
Bent*			1

* This isn't one of the basic five, but shows up on the chart in the notes.

39. When atoms with 2, 3, or 4 valence electrons form bonds, their orbitals undergo _____.
40. When orbitals combine there will always be only 1 _____ orbital involved, but there may be as many as 3 _____ orbitals.
41. An sp^2 orbital results from the combination of _____ orbital and _____ orbitals.
42. An sp^3 orbital occurs in molecules with a _____ shape.
43. Which of the following bonded pairs would have the longest bond length: N-N N=N N≡N
44. Which of the following bonded pairs would have the shortest bond length: O-O O=O O≡O

F. Polarity

45. The attraction of atoms for electrons in a bond is called _____.
46. When atoms share electrons equally, they form a _____ bond.
47. When atoms share electrons unequally, they form a _____ bond.
48. When electrons are distributed evenly within a molecule the molecule is _____.
49. When electrons are distributed unevenly within a molecule the molecule is _____.
50. The $\delta^+ \rightarrow$ symbol points to the element with the highest _____.
51. The longer the symbol $\delta^+ \rightarrow$, the greater the _____.
52. A polar molecule is also called a _____.
53. In a polar molecule the atoms with the highest electronegativities attract / repel electrons?
54. The end of the molecule that attracts the electrons takes on a _____ charge.
55. What accounts for the polarity of a bond? _____.
56. What accounts for the polarity of a molecule? _____.
57. How do the boiling points of polar molecules differ from the boiling points of non-polar molecules? _____
_____.
58. In simple molecules, the shape of the molecule affects its _____.
59. In complex molecules, the shape of the molecule is affected by its _____.

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60. Draw ball & stick models of the five basic molecular shapes.

<u>Tetrahedron</u>	<u>Linear</u>	<u>Trigonal Pyramidal</u>	<u>Trigonal Planar</u>	<u>Bent</u>