Study Guide

COVALENT BONDING REVIEW

1.  How many electrons are shared by a single bond?

2.  What type of elements form covalent bonds?

3.  The type of covalent bonding in which two atoms share their electrons evenly is described as \_\_\_\_\_\_\_\_\_\_\_\_\_.

4.  How many electrons are shared by a double bond?

5.  The type of covalent bonding in which two atoms share electrons unevenly resulting in slightly positive and slightly negative regions of the molecule is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

6.  A term that describes an atom's degree of pull for shared electrons is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

7.  A group of covalently bonded atoms possessing a positive or negative charge is called a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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Choose from these\*:      O2         Cl2        H2O       CO2       CH4       NH3       N2

8.  has a tetrahedral shape

9.  has a triple covalent bond

10.  two unshared electron pairs on the central atom results in a polar molecule with a bent shape

11.  no unshared electron pairs on the central atom results in a triatomic linear molecule

12.  one unshared electron pair on the central atom results in a trigonal pyramid shape

13.  diatomic linear molecule is nonpolar with a single bond

\* one of these choices is not used

IONIC BONDING REVIEW
Part 1 - Complete each of the following sentences by filling in the appropriate word or phrase  from the list below.
                negative                    noble gas                        octet                        anion
                positive                     electrons                         ions                         cation
                electron configuration
1.  An ionic bond is an attraction between oppositely charged \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2.  Anions have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge.
3.  An atom becomes an ion by losing or gaining \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4.  The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rule states that atoms tend to gain, lose, or share electrons in order to acquire a
     full set of valence electrons.
5.  When sodium and chlorine form an ionic bond, both ions acquire the electron configuration of a(n)
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
Part 2 - If the statement is true, write "truue".  If it is false, change the underlined word or words to make it true.  Write your answer on the line.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6.  Calcium becomes a cation by gaining two electrons.
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7.  A cation has a positive charge.
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 8.  A sodium ion is smaller in size than a sodium atom.
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 9.  The Lewis dot diagram for chlorine, a group 17 element, has six dots around it.
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 10.  An aluminum ion has a charge of +3 because it gains three electrons.

Part 3 - How many electrons will the following elements gain or lose in forming an ion?

11.  calcium                                                       12.  aluminum

13.  fluorine                                                       14.  oxygen

Part 4 - What will be the formula of the ion formed when the following elements gain or lose valence electrons and attain noble gas configurations?

15.  sulfur                                                          16.  fluorine

17.  sodium                                                       18.  barium

Part 5 - Write the electron configuration for the following ions:

19.  Ca+2                                                                               20.  Al+3

21.  F-1                                                                                   22.  O-2

23.  S-2                                                                                   24.  Na+1

25. Ba+2                                                                                26.  K+1

27.  N-3

LEWIS STRUCTURES 1

|  |  |  |
| --- | --- | --- |
| 1.    SiF4  Bond PolarityMolecular Polarity:Shape:Geometry: | 2.    BF3  Bond PolarityMolecular Polarity:Shape:Geometry: | 3.    NH3  Bond PolarityMolecular Polarity:Shape:Geometry: |
| 4.    H2O Bond PolarityMolecular Polarity:Shape:Geometry: | 5.    CHBr3 Bond PolarityMolecular Polarity:Shape:Geometry: | 6.    HI Bond PolarityMolecular Polarity:Shape:Geometry: |
| 7.    SO3 Bond PolarityMolecular Polarity:Shape:Geometry: | 8.    AsCl3 Bond PolarityMolecular Polarity:Shape:Geometry: | 9.    H2S Bond PolarityMolecular Polarity:Shape:Geometry: |
| 10.    SeH2 Bond PolarityMolecular Polarity:Shape:Geometry: | 11.    PO4-3 Bond PolarityMolecular Polarity:Shape:Geometry: | 12.    NO2-1 Bond PolarityMolecular Polarity:Shape:Geometry: |
| 13.    ClO3-1 Bond PolarityMolecular Polarity:Shape:Geometry: | 14.    HCN Bond PolarityMolecular Polarity:Shape:Geometry: | 15.    PI3 Bond PolarityMolecular Polarity:Shape:Geometry: |

LEWIS STRUCTURES 2

|  |  |  |
| --- | --- | --- |
| 1.    OF2  Bond PolarityMolecular Polarity:Shape:Geometry: | 2.    GeI4  Bond PolarityMolecular Polarity:Shape:Geometry: | 3.    SCl2  Bond PolarityMolecular Polarity:Shape:Geometry: |
| 4.    SeO2  Bond PolarityMolecular Polarity:Shape:Geometry: | 5.    SO3  Bond PolarityMolecular Polarity:Shape:Geometry: | 6.    NH4+1  Bond PolarityMolecular Polarity:Shape:Geometry: |
| 7.    ONCl  Bond PolarityMolecular Polarity:Shape:Geometry: | 8.    CO2  Bond PolarityMolecular Polarity:Shape:Geometry: | 9.    SO4-2  Bond PolarityMolecular Polarity:Shape:Geometry: |
| 10.    ICl  Bond PolarityMolecular Polarity:Shape:Geometry: | 11.    CH2Cl2  Bond PolarityMolecular Polarity:Shape:Geometry: | 12.    H3O+1  Bond PolarityMolecular Polarity:Shape:Geometry: |
| 13.    N2  Bond PolarityMolecular Polarity:Shape:Geometry: | 14.    ClO-1  Bond PolarityMolecular Polarity:Shape:Geometry: | 15.    CH2O  Bond PolarityMolecular Polarity:Shape:Geometry: |

Unit 6 Review Worksheet

1.  Individual atoms of elements are ( more / less ) stable than when they are combined with
     other elements.

2.  What is the difference between ionic and covalent bonding?

3.  What is the cut-off number for the difference in electronegativity to determine whether a
     bond is ionic or covalent?

4.  Between what types of elements does ionic bonding occur?

5.  Between what types of elements does polar covalent bonding occur? Nonpolar covalent?

6.  What should you do with any left over electrons when drawing Lewis structures?

7.  What should you do if you have used all of the electrons and the central atom still does not
     have 8 electrons?

8.  How can you tell which is the central atom by looking at the chemical formula?

9.  What two (2) requirements must a molecule meet in order to be considered nonpolar?

10.  What do “A”, “B”, and “E” stand for when determining the class of a molecule?

11.  What does the subscript “2” mean in the class AB2E?

12.  Describe the molecules that have a bent shape. What do they look like?

13.  Describe the molecules that have linear shape. What do they look like?

14.  Describe the molecules that have a tetrahedral shape. What do they look like?

15.  Describe the molecules that have a trigonal planar shape. What do they look like?

16.  Describe the molecules that have a trigonal pyramidal shape. What do they look like?

17.  What is the smallest unit of an ionic compound called?  A covalent compound?

18.  Which type of compound has low melting points?

19.  Which type of compound dissolves in water?

20.  Which type of compound conducts electricity when melted?

21.  Which type of compound occurs as liquids, gases, or non-crystalline solids?

22.  What are the four types of intermolecular forces?

23.  Between which types of compounds do these intermolecular forces occur?

24.  Arrange the following in order of increasing strength:
            (A) hydrogen bonding                 (B) covalent bonding      (C) dipole-dipole forces
            (D) London dispersion forces       (E) dipole-induced dipole forces

25.  For each of the following compounds, draw the Lewis structure.  Then tell the molecular polarity,
       class, and shape of the molecule.  Also tell the type(s) of IM forces that occur within
       a sample of that compound.
                (A)            SiF4
                (B)             SBr2
                (C)             NH3
                (D)            SO3
                (E)             SiO2
                (F)             SeS2