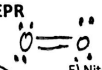
## Unit 9 Test Review: Chemical Bonding and VSEPR

1. Which of these diatomics contain a double bond?
   A) Iodine B) Fluorine C) Hydrogen D) Oxygen E) Nitrogen



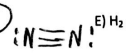
2. Which of the following compounds is not covalent?
   A) $SCl_2$ B) KCl C) $NO_2$ D) $H_2O$ E) $Cl_2$

   Ionic

3. How many valence electrons does the HALOGEN group have?

   group 17 = 7 $e^-$

4. A diatomic molecule with a triple covalent bond is:
   A) $F_2$ B) $Br_2$ C) $O_2$ D) $N_2$ E) $H_2$



5. If a bonding pair of electrons is unequally shared between two atoms, the bond is:

   Polar

6. Which of the following has a tetrahedral geometry?
   A) $CO_2$
   B) HF
   C) $H_2O$
   D) $CF_4$
   E) $NO_2$

7. Methane ($CH_4$) contains polar bonds and nonpolar overall molecular polarity.
   A) Polar, polar B) polar, nonpolar C) nonpolar, polar D) nonpolar, nonpolar

8. In forming the molecule HF, the F atom has how many lone pairs?
   A) 2
   B) 3
   C) 4
   D) 5
   E) 6

9. An ionic compound is _____.
   A) a salt
   B) held together by an ionic bond
   C) composed of cations and anions
   D) usually a solid at room temperature
   E) all of the above

10. Choose which answer correctly matches the molecule with its corresponding shape.
    A) phosphorus trihydride — trigonal pyramidal
    B) dihydrogen monoxide — trigonal planar
    C) chlorine molecule — bent
    D) carbon tetrachloride — trigonal pyramidal
    E) boron trihydride — tetrahedral

11. Which statement best characterizes water?
    A) Water is a non-polar compound composed of non-polar bonds.
    B) Water is a polar compound composed of polar bonds.
    C) Water is a non-polar compound composed of polar bonds.
    D) Water is a polar compound composed from non-polar bonds.
    E) Water is a neutral compound composed from ionic bonds.

12. Which of the following statements is TRUE?
    A) $I_2$ exhibits a triple covalent bond
    B) NaCl forms by sharing pairs of electrons
    C) $O_2$ exhibits a double covalent bond
    D) $NH_3$ is an ionic compound
    E) $PH_3$ is a non-polar molecule

13. Which of the following types of solids exhibits malleability?
    A) covalent network B) ionic C) non-polar covalent D) metallic E) polar covalent

14. Ionic compounds will conduct electricity in the _____
    A) Aqueous state
    B) Solid state
    C) Molten state
    D) Both aqueous and solid states
    E) Both aqueous and molten states

15. Why do atoms form chemical bonds?

    To become stable by attaining the noble gas configuration

16. What is a metallic bond? How do you recognize it? List ALL properties of metallic bonds.

    - Metal + metal - luster -conducts heat/electricity
    -Sea of electrons -Malleable/ductile - high melting point.

17. What is an ionic bond? How can you recognize it? List ALL properties of ionic bonds.

    -metal + nonmetal - brittle -High melting point.
    -transfer of $e^-$ - dissolves in water -Low volatility
    - conducts electricity @ molten and aqueous state

18. What is a covalent bond? How can you recognize it? List ALL properties and the types of covalent bonds.

    -nonmetal + nonmetal - doesn't conduct electricity
    - shared $e^-$ - sometimes dissolves

19. What is the difference between a polar and a nonpolar covalent BOND?

    polar = unequal sharing : H—F

    nonpolar = equal sharing : H—H

20. How do you determine whether a MOLECULE is polar or nonpolar?

polar = lone pairs or different atoms around → nonpolar = NO Lone pairs & same atoms around

21. Whenever you NASL, what is different when working with polyatomic ions?

add/subtract in available section. Use brackets & charge

22. A single bond contains 2 shared electrons. A double bond shares 4 electrons. A triple bond shares 6 electrons.

23. Which two elements are the exception to the octet rule when forming covalent bonds? H(2) B(6)

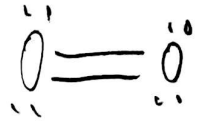
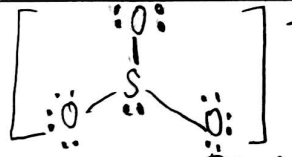
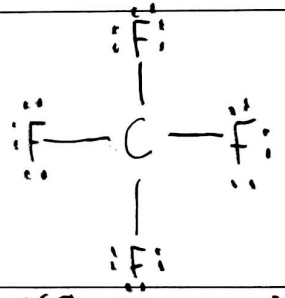
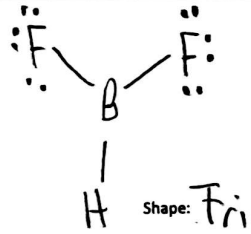
24. What does VSEPR stand for? What is the basis of VESPR theory?

Valence Shell Electron Pair Repulsion

25. Using a periodic table determine whether the following bonds would be metallic (M), ionic (I), polar covalent (PC), nonpolar covalent (NPC), or network covalent:

Li + O I  N + N NPC  S + Cl PC  Zn + Zn M

C + H PC  S + O PC  Ca + Br I  carbon chains network covalent

| | Ionic or Covalent? | If **ionic** show the transfer of electrons and final ion combination.<br>If **covalent**, NASL, draw the Lewis structure, determine its shape, and give the molecular polarity (polar or nonpolar?).<br>SHOW ALL WORK! |
|---|---|---|
| 26. **Mg + P** | I |  → $3[Mg^{+2}]\,2[N^{-3}]$ $(Mg_3N_2)$ |
| 27. **$O_2$** | C |  Shape: Linear  Molecular Polarity: NP |
| 28. **$SO_3^{-2}$** | C | $8+3(8)=32$  $6+3(6)+2=26$  $=6\to3$  $26\to13$   Shape: Tri. Pyramidal  Molecular Polarity: P |
| 29. **$CF_4$** | C |  Shape: Tetrahedral  Molecular Polarity: NP |
| 30. **$HBF_2$** | C | $2+6+2(8)=24$  $1+3+2(7)=18$  $=6\to3$  $=12\to6$   Shape: Tri. planar  Molecular Polarity: P |