Name_____________________ StdntNo___________________

Remember to put all final answers on the answer sheet.

1. Which of the following does not have a dipole moment?
   a. HCl
   b. CO
   c. NCl₃
   d. BCl₃
   e. all have a dipole moment

2. Which compound should be the most ionic?
   a. LiF
   b. NaF
   c. KF
   d. RbF
   e. LiI

3. Which compound should be most covalent?
   a. OF₂
   b. SO₂
   c. SF₆
   d. AsCl₃
   e. Br₂

4. Which ions are isoelectronic?
   a. Li⁺, Na⁺, K⁺
   b. F⁻, Cl⁻, Br⁻
   c. F⁻, Na⁺, Mg⁺²
   d. a and b
   e. all of the above

5. On formation of a positive ion, the size of a metal atom would be predicted to:
   a. always increase
   b. always decrease
   c. remain the same
   d. depends on the metal
   e. metals don't form positive ions

6. For the compound PCl₃, the bond angles would be approximately
   a. 90
   b. 109
   c. 120
   d. 90 and 120
   e. 180
7. The shape of the CO$_3$-2 ion is
   a. trigonal planar
   b. pyramidal
   c. linear
   d. bent
   e. tee shaped

8. In going from a single to a triple bond between atoms, the trend in the bond length and bond strength are
   a. increase/increase
   b. increase/decrease
   c. decrease/increase
   d. decrease/decrease
   e. depends on element

9. Which compounds or ions exhibit resonance?
   a. O$_2$
   b. H$_2$S
   c. NO$_2^-$
   d. HCl
   e. two of the above

10. Which compounds cannot be described adequately using Lewis structures?
    a. SO$_2$
    b. NO$_2$
    c. CO$_2$
    d. SiO$_2$
    e. none of the above

11. Calculate the molar heat of formation of NH$_3$(g) from the reaction:
    \[ \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) \]

    Given the following bond energies:
    \[
    \begin{align*}
    \text{N-N(triple)} &= 941 \text{ kJ} \\
    \text{H-H} &= 432 \text{ kJ} \\
    \text{N-H} &= 391 \text{ kJ}
    \end{align*}
    \]
    a. +109 kJ
    b. -109 kJ
    c. +54.5 kJ
    d. -54.5 kJ
    e. none is correct

12. What is the formal charge on S in the compound H$_2$S?
    a. 0
    b. +1
    c. -1
    d. +2
    e. -2
13. How many lone pairs are present on S in the compound H2S?

a. 0  
b. 1  
c. 2  
d. 3  
e. 4

Questions 14-21 dealt with radioactivity and have been deleted

22. What technique would best identify the type of branching present in the carbon chain of a new organic compound?

a. IR-infrared spectroscopy  
b. C,H,N,O-combustion analysis  
c. NMR-nuclear magnetic resonance  
d. Melting or boiling point  
e. UV-ultraviolet spectroscopy

23. The most reasonable name for the following alkane is:

[Chemical structure image]

a. 2,3-diethyl-2-methylbutane  
b. 2,3-diethyl-2,3-dimethylpentane  
c. 3,4-diethyl-3,4-dimethylpentane  
d. 4-ethyl-3,3,4-trimethylhexane  
e. 3-ethyl-3,4,4-trimethylhexane

24. Aromatic compounds are identified by the presence of:

a. double bonds  
b. functional groups  
c. unsaturated rings  
d. triple bonds  
e. isomerism

25. The characteristic that distinguishes polymers from other types of organic molecules is:

a. the presence of functional groups  
b. the presence of double bonds  
c. vulcanization  
d. free radicals  
e. long, chainlike structure