Name _____ AP Chemistry

HW 2: Due 1/26/17 Write the letter of the correct answer on the line in front of the question.

1. _____ Which of the following molecules has the shortest bond length?
a. N_2 b. O_2 c. Cl_2 d. Br_2 e. I_2

2. _____ For which of the following molecules are resonance structures necessary to describe the bonding satisfactorily?
a. H_2Se b. SeO_2 c. CS_2 d. SeF_2 e. NF_3

3. _____ Which of the following bonds is expected to be most polar?
a. C-Si b. C-N c. O-C d. S-C e. H-C

4. _____ For which of the following may we draw both polar and nonpolar Lewis structures?
a. $CHCl_3$ b. PH_3 c. BF_3 d. SF_2Cl_4 e. PCl_5

5. _____ Which of the following has a non-bonding pair of electrons on the central atom?
a. BCl_3 b. NH_3 c. CCl_2Br_2 d. PF_5 e. SO_4^{2-}

Use the following answers for questions 6-10. Choose the correct geometry for the molecules listed.
a. trigonal planar b. trigonal pyramidal c.linear
d. bent e. tetrahedral

6. _____ OF_2

7. _____ PH_3

8. _____ NO_2^-

9. _____ CH_2F_2

10. _____BF_3

11. _____ The SF_5^- ion has a square pyramidal structure. The hybridization of the orbitals in sulfur is:
a. dsp^3 b. sp c. d^2sp^3 d. sp^3 e. sp^2

12. _____ Which of the following is not a linear structure?
a. I_2 b. I_3^- c. CO_2 d. H_2S e. H-C≡C-H

13. _____ The Lewis structure of the cyanide ion most closely resembles:
a. N_2 b. O_2 c. CO_2 d. NO e. C_2H_2

14. _____ In which of the following pairs are the two items NOT properly related?
a. sp^3 and 109.5° b. trigonal planar and 120° c. octahedral and dsp^3
d. sp and 180° e. square planar and d^2sp^3

15. _____ How many resonance structures are possible for the CO_2 molecule?
a. none b. 2 c. 3 d. 4 e. 4/3

16. _____ Pi bonding occurs in each of the following species EXCEPT
a. CO_2 b. NO_3^- c. CN^- d. SO_2 e. SiH_4

17. _____ Ca, V, Co, Zn, As
Gaseous atoms of which of the elements above are paramagnetic?
a. Ca and As only b. Zn and As only c. Ca, V, and Co only
d. V, Co, and As only e. V, Co, and Zn only

Use the following answers for questions 18 - 22. Choose the correct geometry for the molecules listed.

a. trigonal planar b. trigonal pyramidal c. square pyramidal
d. bent e. tetrahedral

18._____ OBr_2

19. _____ PCl_3

20. _____ NO_3^-

21. _____ BrF_5

22. _____ NF_3

Use the following answers for questions 23 - 25.
a. O b. La c. Rb d. Mg e. N

23. _____What is the most electronegative element of the above?

24. _____Which element exhibits the greatest number of different oxidation states?

25. _____Which of the elements above has the smallest ionic radius for its most commonly found ion?

26. _____The elements in which of the following have most nearly the same atomic radius?
a. Be, B, C, N b. Ne, Ar, Kr, Xe c. Mg, Ca, Sr, Ba
d. C, P, Se, I e. Cr, Mn, Fe, Co

27. _____Which of the following sets of quantum numbers (n, l, ml, ms) best describes the valence electron of highest energy in a ground-state gallium atom (atomic number 31)?
a. 4, 0, 0, ½ b. 4, 0, 1, ½ c. 4, 1, 1, ½ d. 4, 1, 2, ½ e. 4, 2, 0, ½

28. _____ Pi bonding occurs in each of the following species EXCEPT
a. HCN b. CCl_2F_2 c. SiO_2 d. SeO_2 e. SiO_3^{2-}

29. _____ The bonding in carbon monosulfide consists of:
a. 2 sigma bonds and 1 pi bond b. 1 sigma bond and 2 pi bonds
c. 3 pi bonds d. 3 sigma bonds e. 1 sigma and 1 pi bond

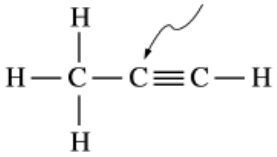
30. _____Which species has the smallest Cl-A-Cl bond angle where A is the central atom?
a. BCl_3 b. CCl_4 c. NCl_3 d. OCl_2 e. SCl_6

31. _____ If a sulfur trioxide molecule is drawn so that the formal charge on each atom is zero, it will have the following types of bonds:
a. 3 σ and 0 π b. 3 σ and 1 π c. 3 σ and 2 π d. 3 σ and 3 π e. 3 σ and 6 π

32. _____ Which of the following atoms is the most paramagnetic?
a. sodium b. aluminum c. magnesium d. sulfur e. chlorine

33. _____ I. PF_4^+ II. SF_2 III. NO
Which species have one or more atoms that violate the octet rule?
a. I and II only b. III only c. I only d. I, II &III e. I and III only

Use the structural formula for propyne, (CH_3CCH) to the right for questions 34-35.



34. _____ What is the hybridization of the carbon atom indicated by the arrow?
a. sp b. sp^2 c. sp^3 d. dsp^3 e. d^2sp^3

35. _____Indicate the total number of sigma (σ) bonds and the total number of pi (π) bonds in the molecule.
a. 8 sigma & 0 pi b. 7 sigma and 1 pi c. 6 sigma & 2 pi
d. 5 sigma & 3 pi e. 3 sigma & 5 pi