

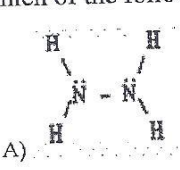
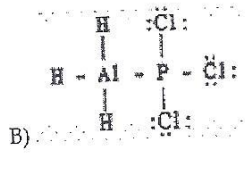
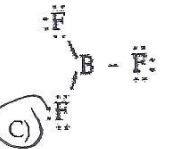

Name Key (print) Name _____ (sign)
 Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam)

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts per question, 21 pts total)

- 1) Which of the following processes represents the first ionization energy of bromine? 1) D
- A) $\text{Br}(g) + e^- \longrightarrow \text{Br}^-(g)$ B) $\text{Br}_2(g) \longrightarrow \text{Br}_2^+(g) + e^-$
 C) $\text{Br}(g) \longrightarrow \text{Br}^{+2}(g) + 2 e^-$ D) $\text{Br}(g) \longrightarrow \text{Br}^+(g) + e^-$

- 2) Atoms having equal or nearly equal electronegativities are expected to form 2) C
- A) no bonds B) polar covalent bond
 C) nonpolar covalent bonds D) ionic bonds

- 3) Order the elements S, Cl, and F in terms of increasing atomic radii. 3) C
- A) Cl, F, S B) S, Cl, F C) F, Cl, S D) F, S, Cl

- 4) Which of the following molecules contains a central atom with sp^2 hybridization? 4) C
- A)  B) 
 C)  D) 

- 5) Choose the element with the highest ionization energy. 5) A
- A) P B) Na C) Al D) Mg

- 6) In the reaction between magnesium and sulfur, the magnesium atoms 6) A
- A) becomes cation B) share electrons with sulfur
 C) becomes anion D) become part of polyatomic ions

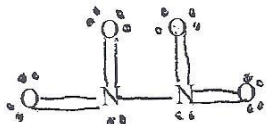
- 7) For the elements Ba, F, and P, the order of increasing electronegativity is: 7) B
- A) none of these B) $\text{Ba} < \text{P} < \text{F}$ C) $\text{Ba} < \text{F} < \text{P}$ D) $\text{F} < \text{Ba} < \text{P}$

Part II: Short Answers (48 pts) Show work on all questions for partial and full credit.

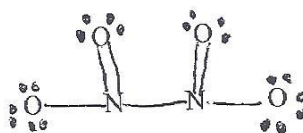
1. For the compound N_2O_4 (24 pts)
 a. Show the valence electron count for drawing a Lewis Dot structure. (8 pts)

$$2(5) + 4(6) = 34$$

- b. Given the following two Lewis Dot structures, which is the correct Lewis Dot structure. Circle the letter of the correct structure (4 pt)



(a)



(b)

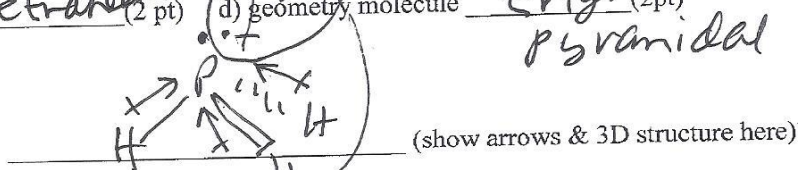
$$17 \times 2 = 34$$

- c. Give **one reason** why the structure that you said is incorrect is wrong. (4 pts)

- ① too many e ② O + N cannot exceed octet 2nd period elements
2. For the molecule whose correct Lewis Dot structure is shown below, answer the following about the central P atom. (16 pts total, 2 pts each)

- a) # of VSEPR electron pairs (or domains) 4 (2pt) b) # of lone pairs 1 (2pt)

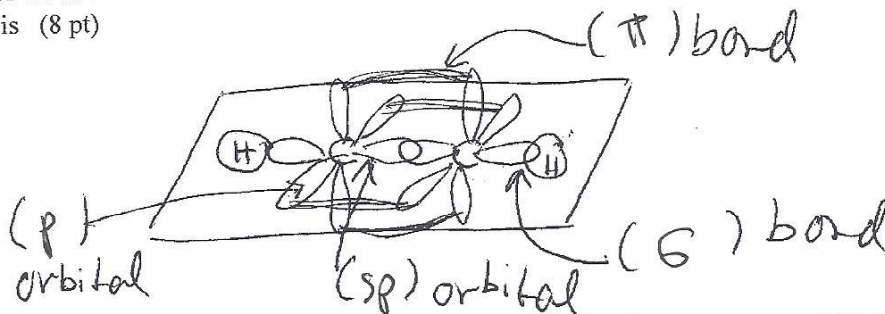
- c) geometry of electron pairs tetrahedral (2pt) d) geometry molecule trigonal pyramidal (2pt)



- e) hybridization of P sp^3 (2 pt)
 f) On the Lewis Dot structure above, show individual bond dipole moment arrows. (2 pts)
 g) Draw the vector sum dipole moment arrow. (2 pts)

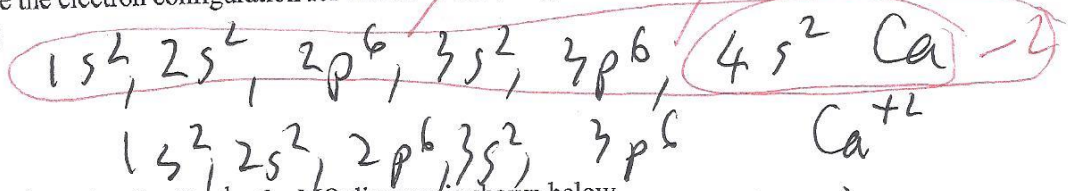
- h) Is the molecule as a whole [(polar)] or (nonpolar)] (circle one)(2 pt)

3. For the molecule $H-C \equiv C-H$ Given the following diagram, label the diagram by filling in parenthesis (8 pt)

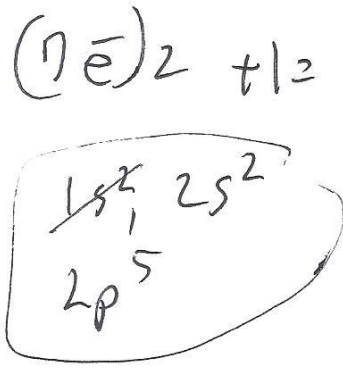
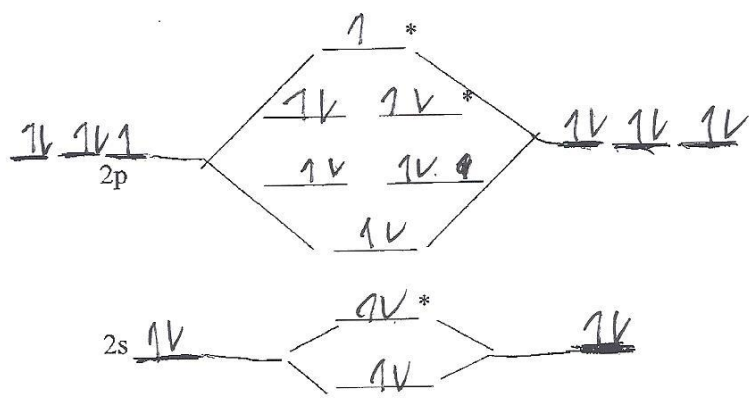


Part III: Long Answers (29 pts) Show work on all questions for partial and full credit even on questions which do not specify.

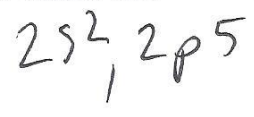
1. Give the electron configuration for the Ca^{+2} ion using the notation $1s^2, 2s^2, \dots$ Starting from $1s^2$ (6 pts)



2. For the molecule F_2^{-1} , the MO diagram is shown below.



a. Show the valence electron configuration for the atom F. (6 pts)



not valence -2

attempt -1

b. Fill in your MO diagram (above) with the correct number of electrons. (6 pt)

c. For the above question, what is the bond order $\frac{1}{2}$ [bond order = $\frac{1}{2} * \{ \# \text{ bonding electrons} - \# \text{ antibonding electrons} \}$] (show work) (4 pt)

$BO = \frac{1}{2} (8 - 7) = \frac{1}{2}$

attempt -1

d. Based on the bond order given above, the F_2^{-1} molecule is a [(stable) or (unstable)] (circle one) molecule (3 pt)

Some what stable

e. Is the molecule (if it is stable enough to exist) [(paramagnetic) or (diamagnetic)] (circle one) (4 pt)