

Academic Honesty: The answers on this test are my own and I am using only the allowed set of notes as described in the syllabus. I have not discussed the test questions with anyone before or during the test nor have I seen the test questions prior to the exam. If you violate any of the preceding items or do not sign, your semester grade is a F.

Signature: _____

Feel free to adjust the amount of spacing between problems to fit your answer.

1. What is the relative size of the _____ atom? Basis / rationale / reason? clearly identify which atom you are comparing; do not use "it", since it could be ambiguous. [10 points]

a. silicon versus carbon

size: $Si > C$ b/c

Si has more e⁻ shell based on e⁻ config

b. tin versus iodine

size: $I < Sn$ b/c

$I: \begin{matrix} 7 & 2 \\ 1 & 5 \end{matrix} \} \rightarrow \uparrow Z_{eff} \rightarrow \uparrow F_{attr} \rightarrow \downarrow size$

2. What is the relative first ionization energy of the _____ atom? Basis / rationale / reason? clearly identify which atom you are comparing; do not use "it", since it could be ambiguous. [10 points]

a. fluorine versus chlorine

IE: $Cl < F$ b/c

Cl: more e⁻ shell $\rightarrow \uparrow size \rightarrow \downarrow F_{attr} \rightarrow$ easier to remove e⁻ $\rightarrow \downarrow$ work energy to remove e⁻
 $\downarrow IE$

b. phosphorus versus silicon

IE: $P > Si$ b/c

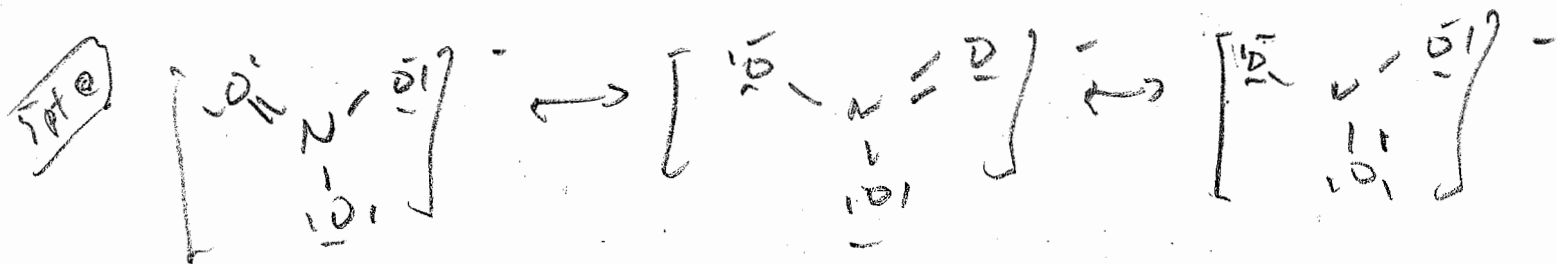
$P: \begin{matrix} 7 & 2 \\ 1 & 5 \end{matrix} \} \rightarrow \uparrow Z_{eff} \rightarrow \uparrow F_{attr} \rightarrow$ harder to remove e⁻ $\rightarrow \uparrow$ work energy to remove e⁻
 \downarrow
 $\uparrow IE$

3. Fill-in the below table. [10 points]

Chemical formula	Chemical name
HgCl_2	mercury (II) chloride
$\text{Fe}(\text{NO}_3)_2$	Iron (III) nitrate
N_2F_6	dinitrogen hexafluoride
Al_2O_3	Aluminum oxide
Na_2S	sodium sulfide

4. Draw / sketch the Lewis structure(s) of the (hypothetical ?) molecule / ion _____. [10 points]

a. Nitrate ion



b. Bromine trifluoride

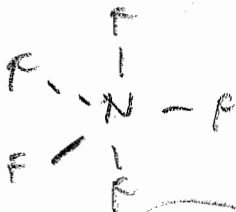
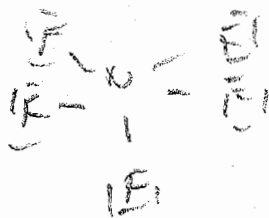


$$\begin{array}{r}
 \text{Br} : 1 \cdot 7 = 7 \\
 \text{F} : 3 \cdot 7 = 21 \\
 \hline
 28 \\
 - 6 \\
 \hline
 22 \\
 - 18 \\
 \hline
 4
 \end{array}$$

continue onto the next page

5. Draw / sketch the shape of ____; include its bond angle(s) and the name of the shape of the (hypothetical ?) molecule.
 [10 points]

a. Nitrogen pentafluoride



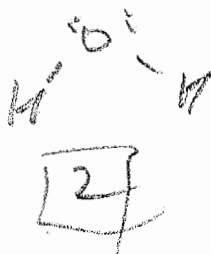
trigonal bipyramidal
 120° & 90°

2 pt

1
 2 pt

$$\begin{array}{r}
 \text{N: } 1 \cdot 5 = 5 \\
 \text{F: } 5 \cdot 7 = 35 \\
 \hline
 40 \\
 \hline
 - 30 \\
 \hline
 10
 \end{array}$$

b. Water

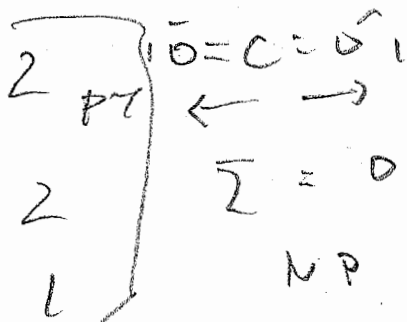


bent
 105°

1 pt
 2

6. Is ____ a polar or nonpolar compound? basis / rationale / reason? [10 points]

a. Carbon dioxide



b. Water

