

2. (24 pts) Draw the **best inequivalent Lewis dot structures (with equivalent resonance structures if appropriate)** for the following molecules and ions. Predict the geometry, draw it in 3-D, label the bond angles. (8 pts each)

Formula	Lewis dot structure(s)	Draw geometry and indicate bond angles	Molecular geometry at each central atom(s)	Hybridiz. at each central atom	Polar or non-polar
SeBr ₄					
HClO ₃					
TeF ₅ ⁻					

3. (6pt)
- Is energy released or absorbed from the surroundings when a covalent bond is broken? (3 pt)
 - From a fundamental physical standpoint why do atoms share electrons with each other? (use more than just an energy argument) (3 pt)

4. (12 pt, 2 pt each) Answer each of the following questions:

_____ a. Trend in Z_{eff} as you go down the periodic table

_____ b. The hybridization of an atom with one lone pair and three bonded atoms

_____ c. The most electronegative element in group IA

_____ d. The electrons removed when forming Tc^{3+} ($Z=43$)

_____ e. An element with a negative value of electron affinity

_____ f. The steric number/#of electron domains for the central atom in NO_2^-

5. (13 pt total)

a. Draw a sketch of a $4d_{yz}$ orbital, labeling the axes clearly. Label any angular and radial nodes. (6 pt)

b. Draw a radial probability diagram for a $4d_{yz}$ orbital with axes and any nodes appropriately labeled. (4 pt)

c. **Add a plot of a 3s orbital to the radial probability diagram above.** Use a dotted line (or another color!) to distinguish it from the plot in part b. (3 pt)

6. (3 pt each, 9 pts total) Circle the appropriate answer(s) as indicated below:

a. The atom with the lowest first ionization energy

S Cl Se Ar

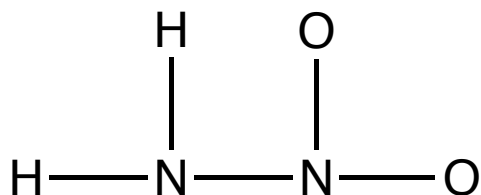
b. The largest size

Rb⁺ Kr Se²⁻ Zr²⁺

c. Molecules that have tetrahedral electron domain (steric number) geometries

SF₄ NF₄⁺ NH₃ H₂O

7. (12 pt) The molecule NH₂NO₂, nitramide is used in explosives such as RDX and HMX. It has the following **skeleton** structure:



a. Complete a valid Lewis dot structure for it and label any formal charges, label all bonds as σ and π . Indicate the hybridization, geometry and bond angles of **all central atoms**. (5 pt)

b. Do a full valence bond description of the molecule (7 pt)