

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Block: \_\_\_\_\_

## Chapter 2 – Bonding, Lewis Structures and Molecular Geometry

### Super Problem

Answer the following questions about the molecules and reactions containing fluorine atoms.

(a) Draw the Lewis structures for

(i)  $\text{CF}_4$

(ii)  $\text{XeF}_4$

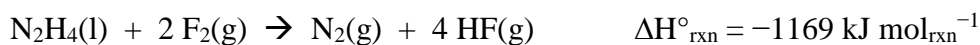
(b) Although  $\text{CF}_4$  and  $\text{XeF}_4$  both have the 4 atoms of fluorine around the central atom they have different molecular shapes. Explain this difference. Be sure to state the correct molecular geometry of both molecules in your explanation.

(c) Identify the hybridization about the C atom in  $\text{CF}_4$ .

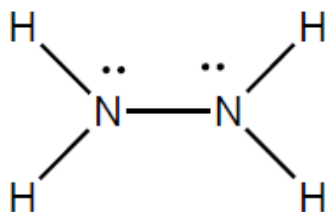
(d) Indicate whether molecules of  $\text{XeF}_4$  are polar or nonpolar. Justify your answer.

- (e) Explain why nitrogen only forms the fluoride  $\text{NF}_3$ , but arsenic forms both  $\text{AsF}_3$  and  $\text{AsF}_5$ .

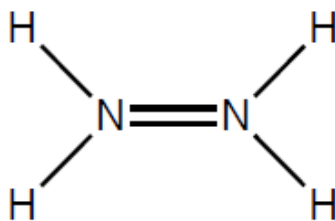
Fluorine reacts with hydrazine,  $\text{N}_2\text{H}_4$ , as shown in the reaction below at  $25^\circ\text{C}$  and 1 atm.



- (f) Determine the number of both sigma and pi bonds in  $\text{N}_2\text{H}_4$ . The Lewis structure for  $\text{N}_2\text{H}_4$  is shown below.



- (g) A student drew the following competing Lewis structure for hydrazine. Use the concept of formal charge to support which Lewis diagram best represents a molecule of hydrazine.



(h) Using the table of bond enthalpies below, calculate the enthalpy of an N–H bond.

Bonds	Bond Enthalpies (kJ/mol)
N—N	160
N≡N	418
N≡N	941
F—H	565
F—F	154
N—H	???

(i) Is the average kinetic energy of the nitrogen gas, N<sub>2</sub>, greater than, less than, or equal to the average kinetic energy of hydrogen fluoride gas, HF, when both are at the same temperature? Justify your answer.