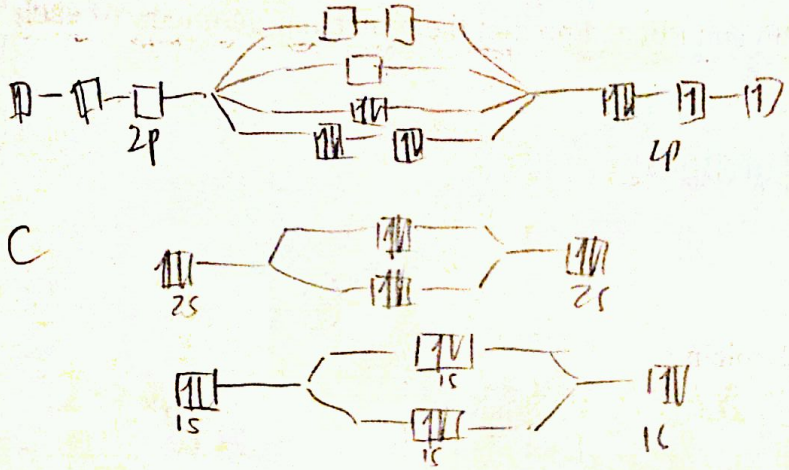
Name: _____

Short Answer (5 pts each)

36. Draw the valence molecular orbital energy level diagram for carbon monoxide, CO.

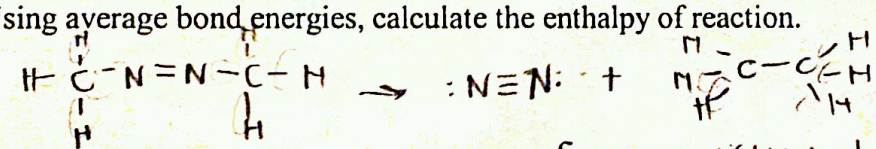


37. When heated, azomethane decomposes into nitrogen gas and ethane gas.

$CH_3N{=}NCH_3(g) \rightarrow N_2(g) + C_2H_6(g)$

Bond	Bond Energy (kJ/mol)	Bond	Bond Energy (kJ/mol)
C-H	413	N-N	163
C-N	305	N=N	418
C-C	346	N≡N	945

Using average bond energies, calculate the enthalpy of reaction.



-2

$= \{6(413) + 2(305) + 418\} - \{418 + 6(413) + 346\}$

$= 264$ kJ/mol

38. Calculate the lattice energy of NaBr(s), given the following thermochemical equations.

$Na(s) \rightarrow Na(g)\ \Delta H_f^\circ = 107$ kJ

$Na(g) \rightarrow Na^+(g) + e^-\ \Delta IE = 496$ kJ

$\frac{1}{2}\ Br_2(g) \rightarrow Br(g)\ \Delta H_f^\circ = 112$ kJ

$Br(g) + e^- \rightarrow Br^-(g)\ \Delta EA = -325$ kJ

$Na(s) + \frac{1}{2}\ Br_2(g) \rightarrow NaBr(s)\ \Delta H_f^\circ = -361$ kJ

-3

$107 + 496 + 112 - 325 - 361 =$ -31 kJ/mol

Name: _____ ID:

5+21=26

Essay (15 pts total: 5 pts for each letter)

39. Consider the molecules PF_3 and PF_5.

(a) Draw the Lewis electron-dot structures for PF_3 and PF_5 and predict the molecular geometry of each

T-shaped

Trigonal bipyramidal

(b) Is the PF_3 molecule polar, or is it nonpolar? Explain.

It is polar. The F's have a slightly more negative charge than the P. The lone pair causes the ~~shape~~ geometry to be slightly distorted. The ~~weight~~ electron density accumulates on the Fluorines pulling the compound down.

(c) On the basis of bonding principles, predict whether each of the following compounds exists. In ea case, explain your prediction.

(i) NF_5

This compound cannot exist because N lacks a d-sub shell. It is also an element in the 2nd period & only elements on the third period & on can do so.

(ii) AsF_5

This compound can exist because it has a d-subshell that will enable it to have more than an octet of electrons. It is also an element on the fourth period.