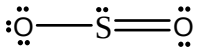
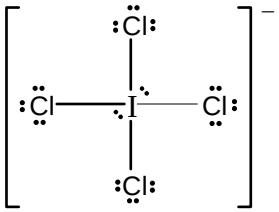
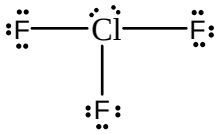
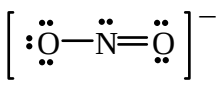
Northern Arizona University **Quiz #8**
CHM 151, General Chemistry I Dr. Brandon Cruickshank
Section 4, Fall 2005 November 10, 2005

Name KEY

1. Complete the following table. [9 pts]

	SO_2	ICl_4^-	ClF_3
Total number of valence electrons in the molecule	18	36	28
Lewis Structure	 plus, you need to draw the second resonance structure		
e^- pair arrangement	trigonal planar	octahedral	trigonal bipyramidal
molecular geometry	bent	square planar	T-shaped
bond angle(s)	120°	90° and 180°	90° and 180°

2. **True or False?** The bonds in the nitrite ion (NO_2^-)
[4 pts]



a) are of different strength **FALSE**

b) are of equal strength **TRUE**

c) are different in length **FALSE**

d) are the same length **TRUE**

3. Write the geometrical shapes (molecular geometry) that VSEPR theory predicts for molecules whose central atoms have the environments indicated. (i.e. Predict the approximate geometrical arrangement of the bonds about the central atom.) [4 pts]

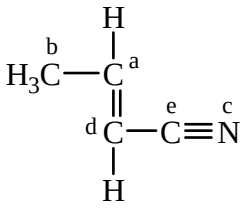
tetrahedral 4 single bonds

angular 2 single bonds and 2 non-bonding electron pairs

trigonal planar two single bonds and one double bond

trigonal pyramidal 3 single bonds and 1 non-bonding electron pair

4. The random letter labels in this diagram of *crotononitrile* are to be associated with the corresponding bond angle (or other property of the nearest atom). [5 pts]



Match the following (using the labels a, b, c, d, or e):

e bond angle ~180°

b atom centering bond angles of ~109.5°

a CCH angle ~120°

d CCC angle ~120°

c atom having one pair of non-bonding valence electrons

5. Use the given *average* bond energy values to *estimate* **Δ*H*** for the following reaction in the gas phase. [4 pts]

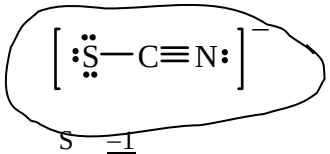
$$2\ H_2 + O_2 \rightarrow 2\ H_2O$$

Bond	Bond Energy (kJ/mol)
O–H	460
H–H	436.4
C–H	414
O–O	347
O=O	620

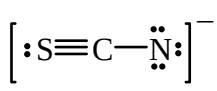
a) +572.8 kJ/mol **b)** +620 kJ/mol **c)** –620 kJ/mol **d)** +347 kJ/mol **e)** **–347 kJ/mol**

Bonds broken: 2 H–H and 1 O=O: (2)(436.4 kJ/mol) + (1)(620 kJ/mol) = 1492.8 kJ/mol
Bonds formed: 4 O–H: (4)(–460 kJ/mol) = –1840 kJ/mol
Δ*H* = 1492.8 kJ/mol + (–1840 kJ/mol) = **–347.2 kJ/mol**

6. Assign ***all*** formal charges, including formal charges of zero, to the molecules below. Which is the "best" Lewis structure based on formal charges? [4 pts]



S –1
C 0
N 0



S +1
C 0
N –2