CHEM 130 **Name** _____
Quiz 10 – December 1, 2017

Complete the following problems. Write your final answers in the blanks provided.

1. At 25°C, a mixture at equilibrium contains 0.250 mol SO_2, 0.125 mol Cl_2 and 0.250 mol SO_2Cl_2 in a 0.500 L container. If 0.100 mol SO_2 is added to the container, what will be the concentration of SO_2Cl_2 when equilibrium is reestablished? (9 points)

$$SO_2(g) + Cl_2(g) \rightleftarrows SO_2Cl_2(g)$$

First, use the equilibrium values to find a K_c:

$$K_c = \frac{[SO_2Cl_2]}{[SO_2][Cl_2]} = \frac{(0.250mol/0.500L)}{(0.25\ mol/0.500L)(0.125mol/0.500L)} = 4.00$$

Now set up an ICE table to find the new equilibrium concentrations. Remember, units must be in M!

	SO_2	+	Cl_2	$\rightleftarrows$	SO_2Cl_2
I	(0.250 + 0.100mol)/0.5 L = 0.700 M		0.125 mol/0.500 L = 0.250 M		0.250 mol/0.500L = 0.500 M
C	-x		-x		+x
E	0.700-x		0.250+x		0.500+x

Now insert into K_c

$$K_c = \frac{[SO_2Cl_2]}{[SO_2][Cl_2]} = \frac{0.500+x}{(0.700-x)(0.250+x)} \quad \frac{0.500+x}{0.175-0.950x+x^2} = 4.00$$

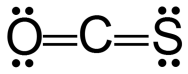
$$0.500+x = 0.700-3.80x+4x^2$$

$$0 = 4x^2 - 4.80x + 0.200$$

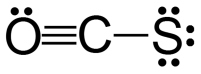
Solving for x, we find x = 1.157 or 0.043. The 0.043 value is the only one that makes chemical sense, therefore $[SO_2Cl_2]$ = 0.500M + 0.043M = **0.543 M**

Answer_____

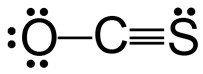
2. Below are three possible Lewis structures for the compound carbonyl sulfide, OCS, which is colorless flammable gas with an unpleasant odor. Calculate formal charges on each of the atoms and use them to predict the structure you would expect to most closely resemble the actual structure of OCS. (8 pts)



FC: 0 0 0



FC: +1 0 -1

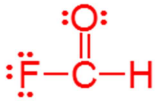


FC: -1 0 +1

Since the structure on the left has formal charge of zero on all atoms, it would be the preferred structure.

Answer_____

3. Draw Lewis structures for the following compounds: (8 points)

Species	Lewis Structure	Species	Lewis Structure
NF_3		**CHFO**	

Possibly Useful Information

$\text{slope} = m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$R = 0.08206\ \text{L atm mol}^{-1}\ \text{K}^{-1}$ $R = 8.314\ \text{J mol}^{-1}\ \text{K}^{-1}$
$pV = nRT$	$\Delta G = -RT\ln K$	$K_p = K_c(RT)^{\Delta n}$

1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.00794	2 2A																2 He 4.00260
3 Li 6.941	4 Be 9.01218											5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.1797
11 Na 22.9898	12 Mg 24.3050	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9381	26 Fe 55.847	27 Co 58.9332	28 Ni 58.693	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.906	46 Pd 106.42	47 Ag 107.868	48 Cd 112.411	49 In 114.818	50 Sn 118.710	51 Sb 121.757	52 Te 127.60	53 I 126.904	54 Xe 131.29
55 Cs 132.905	56 Ba 137.327	57 *La 138.906	72 Hf 178.49	73 Ta 180.948	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.967	80 Hg 200.59	81 Tl 204.383	82 Pb 207.2	83 Bi 208.980	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.025	89 †Ac 227.028	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Rg (272)							

*Lanthanide series	58 Ce 140.115	59 Pr 140.908	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.967
†Actinide series	90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)