Updated July 11/06 **CHAPTER 10 ANSWERS**

NUMERICAL ANSWERS TO ASSIGNED TUTORIAL PROBLEM SETS FOR CHEM205
FROM KOTZ & TREICHEL'S CHEMISTRY & CHEMICAL REACTIVITY, **6th Ed.**

NOTE: none of the answers from Ch.10 have been verified. Please report any errors.

Ch.	Q#	Comments
10	2	NF_3: 26 valence e^-s; electron-pair geometry = tetrahedral; molecular geometry = trigonal pyramidal. The N atom is sp^3-hybridized. Three of these sp^3 hybrid orbitals each overlap with a fluorine 2p orbital to form three N-F sigma (single) bonds; the N's fourth sp^3 hybrid orbital contains a pair of nonbonding electrons (a lone pair).
10	4	(a) CSe_2: sp; (b) SO_2: sp^2; (c) CH_2O: sp^2; (d) NH_4^+: sp^3
10	6a	N (both, actually): sp^3; C: sp^2
	6b	C of CH_3: sp^3; C of C=C and C=O: sp^2
	6c	C of C=C: sp^2; C of C to N triple bond: sp
10	8a	$XeOF_4$: electron pair geometry: octahedral, molecular geometry: square pyramidal, sp^3d^2.
	8b	BrF_5: electron pair geometry: octahedral, molecular geometry: square pyramidal, sp^3d^2.
	8c	SOF_4: electron pair geometry: trigonal bipyramid, molecular geometry: trigonal bipyramidal, sp^3d.
	8d	Br_3^- : electron pair geometry: trigonal bipyramid, molecular geometry: linear, sp^3d.
10	10a	$HOSO_2F$: 32 valence e^-, "electron pair geometry" and molecular geometry at sulfur is tetrahedral: sp^3.
	10b	SO_3F^- : same as part (a).
10	12	SO_2F_2: electron pair geometry: tetrahedral, molecular geometry: tetrahedral, sp^3.
10	24	ClF_2^+ : electron pair geometry: tetrahedral, molecular geometry: bent, sp^3: 109°. ClF_2^- : electron pair geometry: trigonal bipyramid, molecular geometry: linear, sp^3d: 180°.
10	26	The resonance structures are in the text. They all have the same sp^2 (trigonal) hybridization. The unused 2p-orbital on N is used to make the pi-bond.
10	28	CO_2: hybridization: linear - sp, bond angle: 180°, C to O bond order: 2. CO_3^{2-} : hybridization: trigonal - sp^2, bond angle: 120°, C to O bond order: 4/3.
10	32a	Angle A = 120°; angle B = 109° (actually will be distorted because of lone pairs...to approx. 105°); angle C = 109°; angle D = 120°.
	32b	Carbon 1: sp^2; carbon 2: sp^2; carbon 3: sp^3.
10	34a	1 π-bond, 11 σ-bonds
10	34b	C(1) = sp^3, C(2) = sp^2, C(3) = sp^3
10	34c	The C=O bond is the shortest and strongest CO bond.
10	36a	Structure: N (with lone pair) is bonded to 2 H's & S; S also bonded to three O's. The angles around N & S are approximately 109° (tetrahedral).
10	36b	The hybridization of the N atom does not change (sp^3 in NH_2^- and in $H_2N\text{-}SO_3^-$). The S atom hybridization changes from sp^2 in SO_3 to sp^3 in $H_2N\text{-}SO_3^-$.

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10	40	XeO_3: electron pair geometry: tetrahedral - sp^3, molecular geometry: trigonal pyramidal. XeO_4: electron pair geometry: tetrahedral - sp^3, molecular geometry: tetrahedral.
10	46a	C_6 ring C atoms: sp^2; side chain C atoms sp^3; N atom: sp^3.
	46b	angle A = 120°; angle B = 109°;angle C = 109°. (actually will be less...because of lone pair occupying more space than bonding pairs)
	46c	23 sigma-bonds and 3 pi-bonds.
	46d	The molecule is polar.
	46e	The H^+ ion attaches to the most electronegative atom in the molecule, *i.e.* N.
10	52a	CF_4 is isoelectronic with BF_4^- (32 valence electrons)
10	52b	SiF_4 (32 valence electrons) and SF_4 (34 valence electrons) are not isoelectronic.
10	52c	BF_4^-: B is sp^3; SiF_4: F is sp^3; SF_4: S is sp^3d.