CHEM 121 **Name**____

Quiz 2 **January 23, 2009**

Complete the following.

1. An orbital is a reference to: (3 points)
   - I) a region of high electron density.
   - II) a region in an atom where an electron is likely to be found.
   - III) a wave function resulting from specific values assigned to quantum numbers in wave equations.
   - IV) a spherical region around a nucleus where an electron can be found

   a. II, III, and IV
   b. I and II
   c. II and IV
   d. I, II, and III

   Answer _____d______

2. $[Kr]5s^2 4d^{10} 5p^5$ is the electronic configuration of: (3 points)

   a. Te
   b. I
   c. At
   d. Br

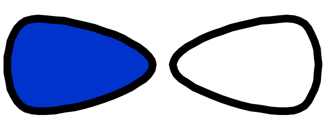
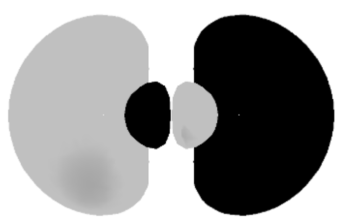
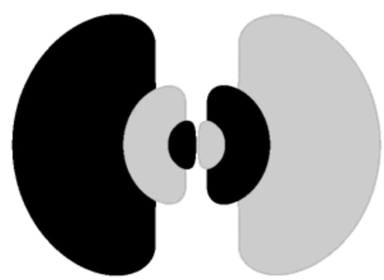
   Answer _____b______

3. Which one of the following set of quantum numbers would not be allowed? (3 points)

   a. $n = 3, \ell = 3, m_\ell = 1$
   b. $n = 3, \ell = 1, m_\ell = -1$
   c. $n = 3, \ell = 2, m_\ell = 1$
   d. $n = 3, \ell = 2, m_\ell = -1$

   Answer _____a______

4. Below is a sketch of a 2p orbital. In the spaces provided, sketch corresponding 3p and 4p orbitals. Justify why you chose to make your drawings as you did. (7 points)

2p	3p	4p
		

Justification:

The key to this problem is understanding what n and ℓ tells us about the shape of an orbital. Remember, and n increases for a given ℓ, we would expect the size of the orbital to increase. Since the number of radial nodes is equal to n-ℓ-1, and n increases, the number of radial nodes should also increase. For n=2 and ℓ = 1, there are 2-1-1=0 radial nodes. The 3p should have one radial node and the 4p should have 2. Since the value for l indicates the general shape, the fact that all three are p orbitals is reflected by the presence of two general lobes. Each time a node occurs, the phase of the orbital (shading) changes.

5. Using spectroscopic “shorthand” notation, write the electron configuration for the following species. Indicate the number of unpaired electrons in each. (3 points each)

   a. silicon (Si)

electron configuration:	**$[Ne]3s^2 3p^2$**
# of unpaired electrons:	**2 (2 of the 2p orbitals hold one electron each)**

   b. selenium (Se)

electron configuration:	**$[Ar]4s^2 3d^{10} 4p^4$**
# of unpaired electrons:	**2 (1 of the 2p orbitals hold two electrons, the other two hold one each)**

   c. fluoride ion (F^-)

electron configuration:	**$1s^2 2s^2 2p^6$ or [Ne]**
# of unpaired electrons:	**0 (the reduction of F to F^- produces noble gas configuration)**

1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.00794																	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											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)