Chem 150 – Exam 4a
Spring 2008

Name: _____

Chemistry 150 Exam 4

Be sure to put your name on each page. This page can be removed from your exam so that you will have a Periodic Table handy throughout the exam, it does not need to be turned in. Show all your work for problems which require any sort of calculation, no credit will be given for answers without work shown. If you have shown a significant amount of work or multiple drawings for a problem, draw a box around what you consider your final answer.

Avogadro's Number = 6.022×10^{23} units/mol
$32.00^{o}F = 0.000^{o}C = 273.15K$
1 foot = 12 inches
1 inch = 2.54cm (exactly)
1 pound = 453.6 g = 16 ounces
1 amu = 1.6605×10^{-24} g
Masses of subatomic particles:
Proton 1.00728amu = 1.6726×10^{-24} g
Neutron 1.00866amu = 1.6749×10^{-24} g
Electron 0.000549amu = 9.1094×10^{-28} g
Density of Water = 1.000 g/mL
$R = 0.08206$ L•atm/mol•K
PV=nRT
1 calorie = 4.184 J = 0.001Calorie
$h = 6.626 \times 10^{-34}$ Jsec
$\lambda = h/mv$
1 J = 1 kg $(m/sec)^2$

$c = \lambda\nu = 3.00 \times 10^{8}$ m/sec
$E_{photon} = h\nu$

1 **H** 1.0079																	2 **He** 4.0026
3 **Li** 6.941	4 **Be** 9.0122											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.180
11 **Na** 22.990	12 **Mg** 24.305											13 **Al** 26.982	14 **Si** 28.086	15 **P** 30.974	16 **S** 32.066	17 **Cl** 35.453	18 **Ar** 39.948
19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.88	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.847	27 **Co** 58.933	28 **Ni** 58.69	29 **Cu** 63.546	30 **Zn** 65.39	31 **Ga** 69.723	32 **Ge** 72.61	33 **As** 74.922	34 **Se** 78.96	35 **Br** 79.904	36 **Kr** 83.80
37 **Rb** 85.468	38 **Sr** 87.62	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57 **La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.03	89 **Ac** 227.03	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)	110 (269)	111 (272)	112 (277)		114		116		

58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.36	63 **Eu** 151.97	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.94	70 **Yb** 173.04	71 **Lu** 174.97
90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** 237.05	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (258)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)

Score

Multiple Choice: Circle the letter of the most correct response. (5pts. per question)

1. A covalent bond:
   a. Involves sharing electrons
   b. Is always polar
   c. Forms ions in solution
   d. Always contains a metal
   e. Always has high bond energy

2. Electronegativity
   a. Is the negative charge of an ion
   b. Is the energy required to remove an electron from an atom in the gas phase
   c. Is the energy required to remove a *pair* of electrons from an atom
   d. Is a measure of how strongly an atom attracts electrons in a covalent bond
   e. Is determined by assigning one electron to each atom of a bond

3. Electronegativity ***decreases***:
   a. In the center of the Periodic Table
   b. As the quantum number "n" decreases
   c. Top to bottom on the Periodic Table
   d. Left to right across the Periodic Table
   e. As atoms get smaller

4. What orbital hybridization gives a ***square planar molecular shape***?
   a. sp
   b. sp^2
   c. sp^3
   d. sp^3d
   e. sp^3d^2

Periodic Trends: For each of the following, circle the letter of the most correct response (4pts) and give a *brief* explanation of your choice (3pts).

5. Which of the following X-O bonds would you expect to be the ***longest***?
   a. CO_2
   b. SO_2
   c. BrO_2^-
   d. SiO_2
   e. O_2

   Explain:

6. Which of the following *atoms* would you expect to be the ***largest***?
   a. Sn
   b. Be
   c. Cr
   d. K
   e. N

   Explain:

Score

7. Which of the following *ions* would you expect to be the ***largest***?
   a. Mg^{2+}
   b. P^{3-}
   c. Al^{3+}
   d. Cl^{-}
   e. K^{+}

Explain:

8. Which of the following would you expect to have the ***highest*** first ionization energy?
   a. Na
   b. Mg
   c. Si
   d. P
   e. Ar

Explain:

9. Which of the following would you expect to have the ***least polar*** bonds?
   a. CO_3^{2-}
   b. CN^{-}
   c. F_2
   d. GeS_2
   e. $TeBr_6$

Explain:

Problems:

For each of the following, write out a correct electron configuration. You may use noble gas shorthand notation for species below the 2nd row of the Periodic Table. (6pts each)

10. Sodium, Na (At.# = 11)

11. Zirconium, Zr (At.# = 40)

12. Selenide ion, Se^{2-} (At.# = 34)

13. Tin(II) ion, Sn^{2+} (At.# = 50)

14. What are the 3 most likely charges (+ or -) of an arsenic (As, At.# = 33) ion? Explain your answers. (15pts)

Score

For each of the following, draw a correct Lewis Structure, determine the formal charge on each atom, name the electronic geometry, draw an appropriate VSEPR structure, and show the dipole moment of any polar molecules/ions. (14pts each)

15. CH_3F

16. CHO_2^- (formate ion)

17. C_2H_2

18. PCl_5

Score