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 non-multiple choice 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 = $1.000\ g/mL$
$R = 0.08206\ L \cdot atm/mol \cdot K$
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** (97.91)	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	71 **Lu** 174.97	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** (209.0)	85 **At** (210.0)	86 **Rn** (222.0)
87 **Fr** (223.0)	88 **Ra** 226.03	103 **Lr** (262.1)	104 **Rf** (265.1)	105 **Db** (268.1)	106 **Sg** (271.1)	107 **Bh** (270)	108 **Hs** (277.2)	109 **Mt** (276.2)	110 **Ds** (281.2)	111 **Rg** (280.2)	112 **Cn** (285.2)	113 **Uut** (284.2)	114 **Fl** (289.2	115 **Uup** (288.2)	116 **Lv** (293)	117 **Uus** (294)	118 **Uuo** (294)

57 **La** 138.91	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
89 **Ac** 227.03	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** 237.05	94 **Pu** (244.1)	95 **Am** (243.1)	96 **Cm** (247.1)	97 **Bk** (247.1)	98 **Cf** (251.1)	99 **Es** (252.1)	100 **Fm** (257.1)	101 **Md** (258.1)	102 **No** (259.1)

Score

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

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

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

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

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

Trends: For each of the following, circle the correct response (1pts) and give a *brief* explanation of your choice (6pts).

7. Which atom is larger? Explain:

   As (Z=33) vs. Sn (Z=50)

8. Which ion is larger? Explain:

   Pb^{2+} vs. Pb^{4+} (Z=82)

9. Which bond is shorter? Explain:

   Si-Cl vs. Si-Br

Score

10. Which CN bond is shorter? Explain:

    H_3CNH_2 vs. CN^{-1}

11. Which element is more electronegative? Explain:

    Br vs. Te

12. Which bond is less polar? Explain:

    N-O vs. Te-I

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. (7pts each)

13. Arsenic atom (At.# = 33)

14. Lead atom (At.# = 82)

15. Bromide ion (At.# = 35)

16. Molybdenum(III) ion (At.# = 42)

17. What are the 3 most likely charges (+ or -) of a antimony ion (At.# = 51)? Explain your answers. (12pts)

Score

18. Methane, CH_4, and ammonia, NH_3, both exhibit tetrahedal electronic geometry, but the H-N-H angles in NH_3 are not exactly 109.5º. Describe how these angles deviate (smaller/larger than expected) and explain why they deviate from the ideal angles of a tetrahedron. (12pts)

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, name the molecular shape, and show the dipole moment of any polar molecules/ions. (12pts each)

19. XeF_4

20. SO_3^{-2}

21. $TeOF_4$

Score