Chemistry 115
Dr. Cary Willard
Exam 3B

Name _____

April 27, 2009

	Points Earned	Points Possible
Part 1 multiple choice		30
Page 2		9
Page 3		15
Page 4		20
Page 5		16
Page 6 Extra credit		10 + 5 extra credit
Total		100

All work must be shown to receive credit. Show all answers to the proper number of significant figures.

$N_A = 6.022 \times 10^{23}/mol$

$PV=nRT$

$R=0.0821$ L atm/mol K= 62.4 L torr.mol K

760 torr = 760 mm Hg = 1.00 atm = 101 kPa = 14.7 psi = 29.9 in Hg

$K = {}^{o}C+273.16$

$0^{o}C=273.16$ K

Grossmont College
Periodic Table

IA												IIIA	IVA	VA	VIA	VIIA	NOBLE GASES
1 **H** 1.008	IIA															1 **H** 1.008	2 **He** 4.002
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 23.00	12 **Mg** 24.30	IIIB	IVB	VB	VIB	VIIB	VIII	VIII	VIII	IB	IIB	13 **Al** 27.00	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.70	29 **Cu** 63.55	30 **Zn** 65.38	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (99)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.9	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.0	89 **Ac** 227.0	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)	110 **??** (269)								

58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (147)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
90 **Th** 232.0	91 **Pa** 231.0	92 **U** 238.0	93 **Np** (237)	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** (260)

Part 1 – Multiple Choice (30 points)

1. Which does not exist as an electron sublevel?
   a. All of the above exist as electron sublevels
   b. 4d
   c. 4f
   d. 4p
   e. 4s

2. How many orbitals are contained in the 2p sublevel?
   a. 1
   b. 6
   c. 2
   d. 4
   e. 3

3. What is the number of valence electrons in a halogen?
   a. 9
   b. 2
   c. 5
   d. 8
   e. 7

4. Which element is in the p-block of the periodic table?
   a. Eu
   b. Li
   c. B
   d. Na
   e. V

5. As one progresses left to right across a period on the periodic table, first ionization energy generally
   a. Increases
   b. Decreases
   c. Remains the same
   d. Unable to determine

6. As the difference in electronegativity between two atoms increases, the percent of ionic character of a bond between those two atoms
   a. Decreases
   b. Increases
   c. Remains the same
   d. Unable to determine

7. Atoms of the nonmetallic elements generally form ions by
   a. Gaining electrons, forming positive ions
   b. Gaining electrons, forming negative ions
   c. Losing electrons, forming positive ions
   d. Losing electrons, forming negative ions

8. A Ca^{+2} ion has an electron configuration that is isoelectronic with
   a. Argon
   b. Neon
   c. Krypton
   d. Xenon
   e. None of the above

9. The volume of a gas must always decrease when
   a. Temperature increases and pressure increases
   b. Temperature increases and pressure decreases
   c. Temperature decreases and pressure increases
   d. Temperature decreases and pressure decreases

10. As the number of molecules in a gas sample increases, temperature and volume remaining constant, the pressure exerted by the gas
    a. Remains the same
    b. Decreases
    c. Increases
    d. Unable to determine

11. Which phase change is sublimation?
    a. Solid to gas
    b. Liquid to gas
    c. Gas to liquid
    d. Solid to liquid

12. Which is a polar molecule?
    a. CCl_4
    b. CO_2
    c. HCl
    d. Cl_2

13. As the attractive forces between the molecules of a liquid increase, its volatility
    a. Remains the same
    b. Increases
    c. Decreases
    d. Is not related to attractive forces

14. At which external pressure will water boil at the highest temperature?
    a. 1.5 atm
    b. 0.5 atm
    c. 2.0 atm
    d. 1.0 atm
    e. Unable to determine

15. A mixture of gases consists of helium at a partial pressure of 400. torr, neon at a partial pressure of 300. torr, and argon at a partial pressure of 200. torr. What is the total pressure of this mixture of gases?
    a. 1000 torr
    b. 300. torr
    c. 760. torr
    d. 900. torr

Part 2 –Problems and Questions (70 points)

1. (4 points) Write the complete electron configuration for chlorine.

2. (5 points) Write the shorthand electron configuration for titanium.

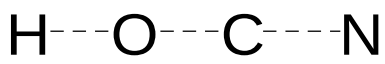
Write the electron configuration of a Ti^{+2} ion.

3. (4 points) Rank the following elements in order of increasing electronegativity. P, Cl, Ga, As

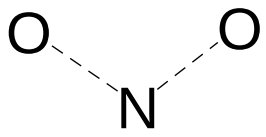
4. (5 points) Is a negative ion is larger or smaller than the atom from which it is formed.

   Why?

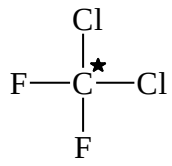
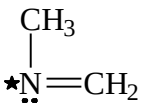
5. (6 points) Draw a lewis electron dot structure for the following ions/molecules. Be sure to show all bonds and lone pairs. The skeleton structures are given.
   a. HOCN



   b. NO_2^{-1}



6. (6 points) Tell the orbital and molecular geometry of the central atom(*)for each of the following structures.

	Orbital geometry	Molecular geometry
a. 		
b. 		
c. 		

7. (4 points) If the pressure of hydrogen gas in a cylinder is 573 torr, what is the pressure in atmospheres?

8. (5 points) A balloon is filled with argon gas at a pressure of 927 torr. Its volume is 3.23 L. What will the new volume be if the pressure of argon is decreased to 803 torr?

9. (5 points) An aerosol can contains nitrogen at a pressure of 7.73 atm in a 25^{o}C room. What will the new pressure of nitrogen in the can be if it is left in the trunk of a car which reaches 53^{o}C?

10. (5 points) If 8.42 grams of carbon dioxide are introduced into a 4.00 L container at 2.99 atm, what will its temperature be (in ^{o}C)?

11. (6 points) Calculate the volume of one mole of Xenon gas at 25^{o}C and 2.00 atm pressure.

    What is its density?

12. (5 points) Calculate the volume of ammonia, NH_3, that can be produced by the reaction of 4.54 L of hydrogen gas and excess nitrogen gas at 25^{o}C and 470 torr.

    $2\ N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$

13. (5 points) Explain using kinetic molecular theory why a gas is less dense than a liquid.

14. (5 points) Which liquid is more viscous, water or motor oil? In which liquid do you suppose the intermolecular attractions are stronger? Explain.

Extra credit (5 points)

Did you attend an event celebrating March as Science Month in San Diego?

If so, what event did you attend?

Tell me what you learned from attending that Science Month event.