CHEM 1215
Exam IV
John IV. Gelder
December 6, 1999

Name _____

TA's Name _____

Lab Section _____

INSTRUCTIONS:

1. This examination consists of a total of 7 different pages. The last page includes a periodic table and a solubility table. All work should be done in this booklet.

2. PRINT your name, TA's name and your lab section number now in the space at the top of this sheet. DO NOT SEPARATE THESE PAGES.

3. Answer all questions that you can and whenever called for show your work clearly. Your method of solving problems should pattern the approach used in lecture. You do not have to show your work for the multiple choice (if any) or short answer questions.

4. Point values are shown next to the problem number.

5. Budget your time for each of the questions. Some problems may have a low point value yet be very challenging. If you do not recognize the solution to a question quickly, skip it, and return to the question after completing the easier problems.

6. Look through the exam before beginning; plan your work; then begin.

7. Relax and do well.

	Page 2	Page 3	Page 4	Page 5	TOTAL
SCORES	_____	_____	_____	_____	_____
	(27)	(21)	(24)	(29)	(100)

(15) 1. Answer the following about the nature of the atom.

a) what are the three fundamental particles in an atom and indicate the charge on each particle;

b) Where is each particle located (generally) in an atom?

c) Describe an electron, i.e., how do we describe the motion of an electron, can we know where the electron is specifically located in an atom?

(12) 2. Atoms of excited neon emit a photon with a wavelength of 865.4 nm.

a) Calculate the frequency and the energy of such a photon.

b) In general terms, what must happen in an excited atom for a photon to be emitted?

(21) 3a. Write the electron configuration for the following three atoms;

N

O

F

b) How many valence electrons does each atom have?

N

O

F

c) What is the effective nuclear charge experienced by the valence electrons in each of these atoms?

N

O

F

d) Which of the three atoms is smallest? Explain.

e) Consider the ions of these atoms, N^{3-}, O^{2-} and F^{-}. The trend in ionic radius for these three ions is $N^{3-} > O^{2-} > F^{-}$ where N^{3-} is the largest ion and F^{-} is the smallest. Explain this trend in size.

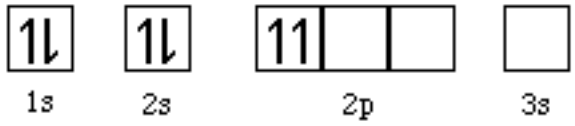
(12) 3a. Write the electron configuration for the following atoms;

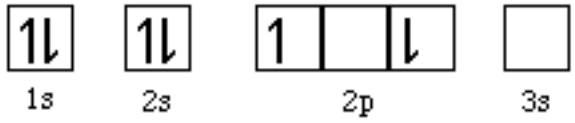
a) Fe^{2+}

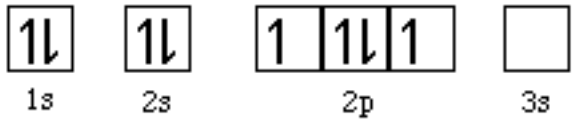
b) Bi

c) Sm

(12) 5. For each of the following orbital diagrams indicate whether the arrangement is a ground state, an excited state, or not allowed. In each case provide a brief explanation.

a) 

b) 

c) 

(12) 6. Draw the Lewis structure for each of the following; (Show all bonding and nonbonding electrons.)

a) NF_3

b) H_2O_2

c) $CHClF_2$

(16) 7. Answer the following questions about compounds;

a) Given a formula of a compound how do you distinguish whether the compound is ionic or covalent?

b) Give an example of an ionic compound.

c) Describe the nature of the ionic bond. (The nature of the attraction in ionic compounds.)

d) What are the two types of ions found in ionic compounds? Given an example of each ion.

e) For each type of ion, what is the difference between a neutral atom and its ion?

Periodic Table of the Elements

	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1 **H** 1.008																	2 **He** 4.00
2	3 **Li** 6.94	4 **Be** 9.01											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
3	11 **Na** 22.99	12 **Mg** 24.30											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.95
4	19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	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
5	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** (98)	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
6	55 **Cs** 132.9	56 **Ba** 137.3	57 **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.8	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)
7	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)									

Lanthanides	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.2	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
Actinides	90 **Th** 232.0	91 **Pa** 231.0	92 **U** 238.0	93 **Np** 237.0	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)

$\lambda = \frac{c}{\nu}$ $E = h\nu$ $c = 3.00 \times 10^{8} \frac{m}{s}$ $h = 6.626 \times 10^{-34}$ J·s

$1\ nm = 1 \times 10^{-9}\ m$