CHEM 1014
Exam III
John III. Gelder
November 18, 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 some useful information. 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/discussion. 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	Page 6	TOTAL
SCORES	_____	_____	_____	_____	_____	_____
	(29)	(20)	(25)	(16)	(10)	(100)

(5) 1. Complete the following table

Substance	# valence electrons
K	
S	
Ag	
N^{3-}	
Na^{+}	

(10) 2. Predict the formula of the compound formed between the following pairs of elements.

a) Mg and O_2 _____

b) Al and sulfur _____

c) potassium and bicarbonate _____

d) barium and sulfate _____

e) C and Cl_2 _____

(14) 3. Complete the following table;

Name of the compound	Formula of the compound
Sodium nitrite	
	$Ba(OH)_2$
ammonia	
	LiI
Zinc phosphate	
	Na_2CO_3
	$MgSO_4$

(20) 4. Answer each of the following

a) Provide a brief description of what is meant by the term *cation*.

b) Provide a brief description of what is meant by the term *anion*.

c) What kinds of compounds contain cations and anions?

d) What is the name of the bond between cation(s) and anion(s)?

e) What is the nature of the bond (attraction) in these compounds? (That is, what holds the ions together to make the bond?)

f) An ion that we have not discussed in great detail is NH_4^+. Draw a Lewis structure of this polyatomic ion.

g) Write a formula for the compound of this ion combined with each of the ions Cl^-, CO_3^{2-}, PO_4^{3-}.

h) NH_4^+ is called the ammonium ion. Provide the name for each compound in g).

(15) 5. Draw the Lewis structure for each of the following compounds/elements. (Show all bonding and nonbonding electrons.)

a) $CHCl_3$

b) OF_2

c) N_2

d) ONCl

e) N_2H_4

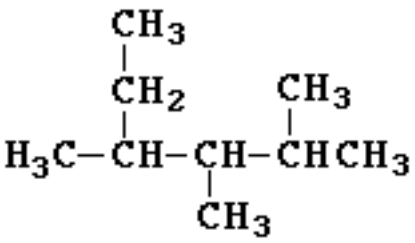
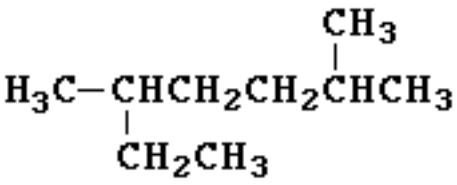
(10) 6. What is the molecular geometry/shape of the following compounds. (Note: In the case of N_2H_4 provide the molecular geometry around each nitrogen.)

Substance	Molecular geometry/shape
H_2S	
OF_2	
$CHCl_3$	
N_2H_4	
H_2CO	

(12) 7. Draw and name six structural isomers for the compound C_7H_{16}. (Be sure to clearly show all bonds between carbon and hydrogen.)

(4) 8. Are there any structural isomers of the compound $C_{10}H_{22}$ with a parent chain five carbons long? If so draw an example and name the compound. If there are no structural isomers with a parent chain of five carbons, briefly explain why.

(6) 9. Name or draw the Lewis structure for the following organic compounds

3-methyl-4,4-diethylheptane		

(4) 10. The equation for the formation of magnesium chloride is,

$$Mg(s) + Cl_2(g) \rightarrow MgCl_2(s)$$

We see the formula Cl_2 appears on both sides of the equation. Using a diagram(s) or words explain the difference in the bonding in the two substances containing chlorine.

Periodic Table of the Elements

	IA												IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1 **H** 1.008	IIA																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	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	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)

Useful Information