CHEM 1215
Exam I
John I. Gelder
September 16, 1998

Name _____

TA's Name _____

Lab Section _____

Please sign your name below to give permission to post your course scores on homework, laboratories and exams. If you do not sign no scores will be posted. All scores will be posted by a random number which will be assigned to you by Dr. Gelder.

_____
(signature)

INSTRUCTIONS:

1. This examination consists of a total of 6 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. You will receive 2 points for knowing your TA's name AND laboratory section number in which you are officially enrolled.

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. No credit will be awarded if your work is not shown in problems 7 and 8.

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

6. 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.

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

8. Relax and do well.

	Page 2	Page 3	Page 4	Page 5	TOTAL
SCORES	_____ (29)	_____ (40)	_____ (26)	_____ (3)	_____ (100)

(6) 1. Indicate the number of significant figures in each of the following numbers;

a) 0.0022022 L **5 significant figures**

b) 2.50×10^{-4} g **3 significant figures**

c) 43,200 m **3 significant figures**

(6) 2. Round off the number 50,525.09 to the indicated number of significant digits;

a) 6 significant figures **50525.1**

b) 4 sig figs **50520 or 5.052×10^4**

c) 2 sig figs **51000 or 5.1×10^4**

(7) 3. Complete each calculation and report the answer to the correct number of significant figures.

a) 104.506 – 6.89

104.506
6.89
97.616
97.62

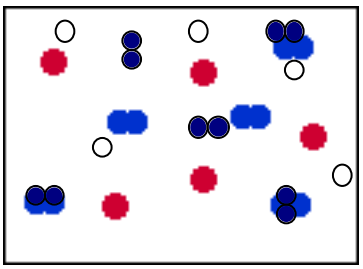
b) $9.890 \times 10^{-2} - 4.3 \times 10^{-4}$

9.890×10^{-2}
0.043×10^{-2}
9.933×10^{-2}

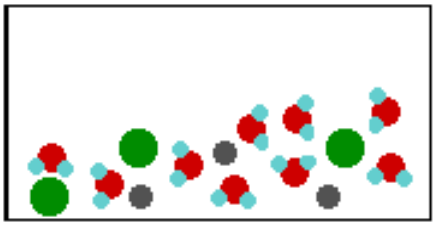
c) $0.49 + \dfrac{1.501 \times 10^1}{(5.012 + 7.26)}$

$0.49 + \dfrac{1.501 \times 10^1}{(12.27)}$
0.49 + 1.223
1.71

(10) 4. Diagram each of the following systems as viewed at the atomic level in the space provided. Be sure to clearly label each of the substances in your diagram.



A gaseous solution of neon and nitrogen.



NaCl dissolved in water

(8) 5. Provide the symbol or the proper spelling of the element's name for each of the following elements.

a) P **phosphorus** b) K **potassium**

c) silver **Ag** d) beryllium **Be**

(8) 6. Write the formula for the binary ionic compound formed from the following pairs of elements.

a) sodium and oxygen **Na_2O** b) iodine and calcium **CaI_2**

c) lithium and hydrogen **LiH** d) nitrogen and magnesium **Mg_3N_2**

(24) 7. Perform the following conversions;

a) 54.0 miles to meters (use at least 3 conversion factors)

$$\mathbf{54.0\ miles}\left(\frac{\mathbf{5280\ feet}}{\mathbf{1\ mile}}\right)\left(\frac{\mathbf{12\ inches}}{\mathbf{1\ foot}}\right)\left(\frac{\mathbf{2.54\ cm}}{\mathbf{1\ inch}}\right)\left(\frac{\mathbf{1\ meter}}{\mathbf{100\ cm}}\right) = \mathbf{8.69\ x\ 10^4\ m}$$

b) $1.24 \times 10^4\ cm^3$ to gallons

$$\mathbf{1.24\ x\ 10^4\ cm^3}\left(\frac{\mathbf{1\ L}}{\mathbf{1000\ cm^3}}\right)\left(\frac{\mathbf{1.0567\ qts}}{\mathbf{1\ L}}\right)\left(\frac{\mathbf{1\ gallon}}{\mathbf{4\ qt}}\right) = \mathbf{3.28\ gallons}$$

c) $14.9\ \frac{g}{cm^3}$ to $\frac{lb}{in^3}$

$$\mathbf{14.9}\ \frac{\mathbf{g}}{\mathbf{cm^3}}\left(\frac{\mathbf{1\ lb}}{\mathbf{454\ g}}\right)\left(\frac{\mathbf{2.54\ cm}}{\mathbf{1\ in}}\right)^{\mathbf{3}} = \mathbf{0.538}\ \frac{\mathbf{lb}}{\mathbf{in^3}}$$

d) 98.6 ˚F to ˚C

$$\mathbf{^\circ C = \frac{5}{9}(^\circ F - 32) = \frac{5}{9}(98.6 - 32) = 37.0\ ^\circ C}$$

(8) 8. Assuming the density of blood is 1.06 $g \cdot mL^{-1}$ and the average person has a mass of 13.31 kg of blood in their body calculate the volume of blood in the body in liters.

$$\mathbf{13.31\ kg}\left(\frac{\mathbf{1000\ g}}{\mathbf{1\ kg}}\right)\left(\frac{\mathbf{1\ mL}}{\mathbf{1.06\ g}}\right)\left(\frac{\mathbf{1\ L}}{\mathbf{1000\ mL}}\right) = \mathbf{12.6\ L}$$

(8) 9. Complete the following table.

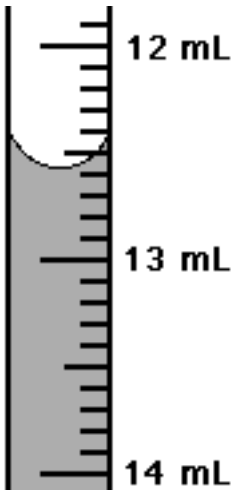
Symbol	# protons	# neutrons	# electrons	charge
$^{57}_{25}Mn^{5+}$	**25**	**32**	**20**	**5+**
$^{85}_{34}\mathbf{Se^{2-}}$	34	51	**36**	2–

(10)10. Describe one of the three reactions shown in lecture. In your description include the substances that were involved in the reaction and at least two physical properties for each substance; describe the reaction which occurred; and write the name, or formula, for any product(s) formed. Include at least two physical properties for the product(s).

Aluminum, a silvery solid was added to bromine a brownish-red liquid. After the aluminum was added to the bromine it was a minute before the reaction began. When the reaction began it appeared as though the aluminum was on fire as the pieces moved rapidly around the surface of the bromine in the beaker. The product, aluminum bromide, was a white solid.

Potassium, a soft silvery solid was added to water, a clear, colorless liquid. A piece of potassium was dropped into a beaker of water. The potassium immediately caught fire emitting a blusih flame and moved rapidly across the surface of the water. One of the products of the reaction is hydrogen, a colorless gas.

Phosphorus, a yellow solid was dissolved in carbon disulfide, a clear, colorless liquid and squirted onto a piece of filter paper. The filter paper rested on the top of a graduated cylinder. The carbon disulfide evaporated filling the graduated cylinder. When enough carbon disulfide had evaporated the phosphorus reacted with oxygen, a colorless gas and caught fire, igniting the carbon disulfide in the graduated cylinder evoking a load 'bark'. The product was tetraphosphorus decaoxide, a white solid.



(3) 11. Determine the level of the liquid in the buret.

12.58 mL

Periodic Table of the Elements

	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII	VIII	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)

Useful Information

1 pound (lb) = 453.59237 gram (gm)

1 liter (L) = 1.056718 quart (qt)

1 inch (in) = 2.54 centimeters (cm)

$^\circ F = \frac{9}{5}{}^\circ C + 32$ density of water = $1.00 \frac{g}{mL}$

$K = {}^\circ C + 273.15$

average atomic mass = Σ(isotopic mass · fractional abundance)