

**Chem 127**  
**Prof. Mark Jensen**  
**Exam #1**  
**9/24/04**

Name \_\_\_\_\_

Pledge:

When you have completed this exam, please consider the following:

*I affirm that I have neither committed nor witnessed a violation of academic integrity in the completion of this exam.*

Signed \_\_\_\_\_

Answer the questions on the following pages, paying strict attention to significant figures where applicable. Answers given without supporting work WILL NOT be given full credit.

Some potentially useful information:

$$N = 6.022 \times 10^{23}$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$1 \text{ mi} = 1760 \text{ yd}$$

$$1 \text{ yd} = 36 \text{ in}$$

$$1 \text{ ton} = 2000 \text{ lb}$$

$$1 \text{ lb} = 453.6 \text{ g}$$

$$1 \text{ ft} = 12 \text{ in}$$

$$V_{\text{cylinder}} = \pi r^2 \cdot h$$

1											18						
IA											VIIIA						
1 H 1.008	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	2 He 4.00
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	
11 Na 22.99	12 Mg 24.31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 -	9 VIIB	10 -	11 IB	12 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
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 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.91	36 Kr 83.30
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 98.91	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
55 Cs 132.91	56 Ba 137.34	71 Lu 174.97	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.98	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226.03	103 Lr 262.1	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt									

57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm 146.92	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	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 239.05	95 Am 241.06	96 Cm 247.07	97 Bk 249.08	98 Cf 251.08	99 Es 254.09	100 Fm 257.10	101 Md 258.10	102 No 255

**No calculators are permitted in answering the following:**

1. (10 pts) Name the following compounds:

a)  $\text{Li}_2\text{O}$  \_\_\_\_\_

b)  $\text{CaCO}_3$  \_\_\_\_\_

c)  $(\text{NH}_4)_2\text{SO}_3$  \_\_\_\_\_

d)  $\text{CuS}$  \_\_\_\_\_

e)  $\text{S}_2\text{Br}_2$  \_\_\_\_\_

2. (10 pts) Give the molecular formula for each of the following:

a) magnesium iodide \_\_\_\_\_

b) sodium dihydrogen phosphate \_\_\_\_\_

c) potassium nitride \_\_\_\_\_

d) nickel (II) permanganate \_\_\_\_\_

e) disilicon hexabromide \_\_\_\_\_

3. (10 pts) Fill in the following blanks with the number 10 raised to a power (e.g.,  $10^{-2}$ ):

a)  $1 \text{ nm} = \text{_____ m}$       c)  $1 \text{ ML} = \text{_____ L}$       e)  $1 \text{ fs} = \text{_____ s}$

b)  $1 \text{ s} = \text{_____ } \mu\text{s}$       d)  $1 \text{ m} = \text{_____ pm}$

4. (10 pts) Fill in the following table:

	Symbol	Number of protons	Number of neutrons	Number of electrons
a)	$^{15}\text{N}^{3-}$			
b)		24	26	18
c)		16	18	18

5. (10 pts) Multiple Choice. Circle the correct answer.

A. Millikan's oil drop experiment:

- a) determined the charge of the proton
- b) determined the mass-to-charge ratio of the electron
- c) determined the charge of the electron
- d) determined the mass-to-charge ratio of the proton

B. JJ Thompson's experiments with cathode rays:

- a) determined the charge of the proton
- b) determined the mass-to-charge ratio of the electron
- c) determined the charge of the electron
- d) determined the mass-to-charge ratio of the proton

C. Rutherford's gold foil experiment:

- a) was the first proof of radioactivity
- b) proved the existence of the electron
- c) proved the existence of the neutron
- d) showed that the positive charge of the atom is contained in a small space

D. Dalton's atomic theory combined each of the following, except the:

- a) Law of Conservation of Energy
- b) Law of Multiple Proportions
- c) Law of Conservation of Mass
- d) Law of Definite Proportions

E. Which of the following statements from Dalton's atomic theory do we now know to be incorrect?

- a) All matter is made of atoms.
- b) All atoms of a given element are identical.
- c) Compounds are formed by combination of two or more different kinds of atoms.
- d) Atoms of different elements have different masses and different properties.

6. (8 pts) Give the name (not the number) of the family to which each of the following elements belongs:

- a) neon \_\_\_\_\_ c) magnesium \_\_\_\_\_
- b) fluorine \_\_\_\_\_ d) potassium \_\_\_\_\_

**Turn in this portion of the exam.**

**You are now permitted to use calculators.**

7. (8 pts) Convert  $7.89 \times 10^{12}$   $\mu\text{g/mL}$  to  $\text{lb/in}^3$

8. (8 pts) The two naturally occurring isotopes of rubidium are rubidium-85, with an atomic mass of 84.91179 amu; and rubidium-87, with an atomic mass of 86.90919 amu. What are the percent natural abundances of these isotopes?

9. (8 pts) A certain compound has a mass percent composition of 21.9 % Mg, 27.8% P, and 50.3 % O. What is its empirical formula?

10. (8 pts) How many oxygen atoms are in 6.00 kg of table sugar,  $C_{12}H_{22}O_{11}$ ?

11. (8 pts) A compound has the structural formula  $\text{HOOCCH}_2\text{CH}(\text{CH}_3)\text{COOH}$ . What is the percent composition of each element in the compound?

12. (10 pts) Iron has a density of  $7.784 \text{ g/cm}^3$ . A piece of iron in the shape of a cylinder has a diameter of 27.2 mm and contains  $8.37 \times 10^{24}$  atoms. What is the height of the cylinder in meters?

**Remember to consider the pledge!!**