Chem 10113, Quiz 1 **Answer Key**

August 29, 2018

Pay attention to significant figures in all calculations!

	IA (1)												IIIA (13)	IVA (14)	VA (15)	VIA (16)	VIIA (17)	VIIIA (18)
1	1 **H** 1.0080	IIA (2)																2 **He** 4.0026
2	3 **Li** 6.9410	4 **Be** 9.0122											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.179
3	11 **Na** 22.990	12 **Mg** 24.305	IIIB (3)	IVB (4)	VB (5)	VIB (6)	VIIB (7)	(8)	VIIIB (9)	(10)	IB (11)	IIB (12)	13 **Al** 26.982	14 **Si** 28.086	15 **P** 30.974	16 **S** 32.066	17 **Cl** 35.453	18 **Ar** 39.948
4	19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.880	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.847	27 **Co** 58.933	28 **Ni** 58.690	29 **Cu** 63.546	30 **Zn** 65.380	31 **Ga** 69.723	32 **Ge** 72.610	33 **As** 74.922	34 **Se** 78.960	35 **Br** 79.904	36 **Kr** 83.800
5	37 **Rb** 85.468	38 **Sr** 87.620	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.940	43 **Tc** 98.907	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.75	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
6	55 **Cs** 132.91	56 **Ba** 137.33	57 **La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.85	75 **Re** 186.21	76 **Os** 190.20	77 **Ir** 192.22	78 **Pt** 195.09	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.20	83 **Bi** 208.98	84 **Po** 208.98	85 **At** 209.99	86 **Rn** 222.02
7	87 **Fr** 223.02	88 **Ra** 226.03	89 **Ac** 227.03	104 Unq 261.11	105 Unp 262.11	106 Unh 263.12	107 Uns 262.12											

1. (6 points) **SHOW ALL WORK.** An atom of cesium (Cs) has a radius of 256 pm (*pico*meter). Imagine a string of individual Cs atoms laid edge to edge in a straight line like a row of golf balls. Determine the length (in inches) of a line of Cs atoms that could be made from a 75.0 fg (*femto*gram) sample of pure cesium. (***Note***: You must use the ***mole concept*** correctly in order to receive any credit for this problem.)

$(75.0 \times 10^{-15}\ g)\ (1\ mole / 132.91\ g)\ (6.022 \times 10^{23}\ atoms / mole) = 3.398 \times 10^{8}\ atoms$

diameter of 1 atom = 2 (256 pm) = 512 pm

$(3.398 \times 10^{8}\ atoms)\ (512\ pm / atom)\ (10^{-12}\ m / pm)\ (1\ cm / 10^{-2}\ m)\ (1\ in / 2.54\ cm)$

$= 6.85\ in$

2. (3 points) Complete the following calculation (assume all values are measured quantities). Write the answer in proper ***scientific notation***, rounded to the ***correct number of significant figures***.

$$\frac{(6.07325 \times 10^{11})\ (54.790 - 6.582)}{(0.87 + 3.531)^2\ (7.1738 \times 10^{-4})} = 2.11 \times 10^{15}$$

3. (3 points) **SHOW ALL WORK.** The ratio of fluorine to antimony by mass in SbF_3 is 0.332:1.00. Determine the formula of another fluoride of antimony in which the mass ratio of fluorine to antimony is 0.553:1.00. This data illustrates Dalton's Law of Multiple Proportions.

Compare mass F to mass Sb ratio in the two compounds:

0.553 / 0.332 = 1.67 = 5/3 (ratio of integers as per Dalton's Law)

Thus, the 2nd compound has 5/3 times more F per Sb than the 1st compound.

∴ the 2nd compound is SbF_5

4. (6 points) **SHOW ALL WORK.** Aerogels are the most porous, lightest, solid materials known. A certain aerogel has a specific gravity of 0.00195. Determine the mass in pounds (lb) of an SUV size block of this aerogel that has a volume of 524 ft^3.

density = 0.00195 g/cm^3

(524 ft^3) (12 in/ft)^3 (2.54 cm/in)^3 (0.00195 g/cm^3) (1 lb / 454 g) = 63.7 lb

5. The element copper (Cu) has two naturally occurring isotopes: ^{63}Cu and ^{65}Cu. The isotope ^{63}Cu has a mass of 62.9296 amu and a natural abundance of 69.17 %.

(a) (2 points) One atom of $^{65}Cu^{2+}$ contains 29 protons, 36 neutrons, and 27 electrons.

(b) (5 points) **SHOW ALL WORK.** Determine the mass of the ^{65}Cu isotope in amu.

abundance of ^{65}Cu = 100 - 69.17 = 30.83 %

(0.6917) (mass of ^{63}Cu) + (0.3083) (mass of ^{65}Cu) = Cu atomic mass

(0.6917) (62.9296) + (0.3083) (mass of ^{65}Cu) = 63.546 amu

mass of ^{65}Cu = 64.93 amu