Chem 10113, Quiz 7

December 5, 2018

Name: _____
(Please Print)

Periodic table:

IA (1)																	VIIIA (18)
1 **H** 1.0080	IIA (2)											IIIA (13)	IVA (14)	VA (15)	VIA (16)	VIIA (17)	2 **He** 4.0026
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
11 **Na** 22.990	12 **Mg** 24.305	IIIB (3)	IVB (4)	VB (5)	VIB (6)	VIIB (7)	. . . . . . VIIIB . . . . . . (8) (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
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
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
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
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. (2 points) Quartz glass, SiO_2, which is the major component of ordinary sand, melts above 1700 °C and does not conduct electricity as a solid or when melted. The most likely crystal type (i.e., ionic, metallic, etc.) for SiO_2 is _____.

2. (3 points) Among the following substances: $HClO_4$, K_2O, HCN, $CsOH$, As_2O_5, HBr, C_5H_5N, which one best matches each description?

   strong base: _____   acidic anhydride: _____   weak acid: _____

3. (2 points) Write a complete, ***balanced chemical equation*** to show how aziridine (structure below) behaves as a ***weak base*** in aqueous solution.

   H_2C
   H_2C >N—H
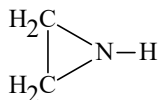
4. (5 points) **SHOW ALL WORK.** The element germanium (Ge) crystallizes in a type of cubic unit cell that is different from any that we have discussed in class. The edge dimension of the unit cell is 565.8 pm (*pico*meters) and the specific gravity of Ge is 5.323. Determine the number of Ge atoms in the unit cell.

5. (5 points) Identify each of the following solids by its crystal type (metallic, ionic, etc.).

(a) $CaO_{(s)}$ _____

(b) $BN_{(s)}$ _____

(c) $CH_3OH_{(s)}$ _____

(d) $SiF_{4(s)}$ _____

(e) $Ca_{(s)}$ _____

(f) $Kr_{(s)}$ _____

6. Lakes that have been acidified by acid rain (containing H_2SO_4 and HNO_3) can be neutralized by a process called liming, i.e., addition of lime ($CaCO_3$).

(a) (2 points) Write a ***balanced net ionic* equation** for the liming process.

(b) (5 points) **SHOW ALL WORK.** What mass (in kg) of $CaCO_3$ (molar mass = 100.1) is required to completely neutralize a 15-billion-liter lake that is 7.5 x 10^{-6} M in H_2SO_4 and 2.5 x 10^{-5} M in HNO_3?

7. (1 point) Which solid has the lowest band gap? (circle one)

$C_6H_{6(s)}$ $\qquad$ $Ge_{(s)}$ $\qquad$ $H_2O_{(s)}$ $\qquad$ $Al_{(s)}$ $\qquad$ $C_{(s,\ graphite)}$

8. The element molybdenum (Mo) crystallizes in a body-centered cubic lattice in which the edge dimension (*l*) of the unit cell is 0.3141 nm (*nano*meters).

(a) (2 points) **SHOW ALL WORK.** Determine the atomic radius (r) of Mo in pm (*pico*meters).

(b) (3 points) **SHOW ALL WORK.** Determine the specific gravity of Mo. (***Note***: The answer to part a is not needed here!)