

## Chem 10113, Quiz 2

September 12, 2018

## Answer Key

1. (5 points) **SHOW ALL WORK.** A metal (M) forms a compound with the formula  $M_2S_3$ . In a chemical analysis, a sample of this compound weighing 2.500 g is found to contain 0.8632 g of S. By doing an appropriate mole-method calculation, determine the identity of the metal M.

$$2.500 \text{ g total} - 0.8632 \text{ g S} = 1.637 \text{ g M}$$

$$(0.8632 \text{ g S}) (1 \text{ mole} / 32.07 \text{ g}) = 0.02692 \text{ mole S}$$

$$(0.02692 \text{ mole S}) (2 \text{ mole M} / 3 \text{ mole S}) = 0.01794 \text{ mole M}$$

$$\text{molar mass of M} = (1.637 \text{ g} / 0.01794 \text{ mole}) = 91.22 \text{ g/mole}$$

$$\therefore \text{M} = \text{Zr}$$

2. (3 points) Write complete chemical formulas for the following ions.

(a) hypoiodite	$\text{IO}^-$	(d) dichromate	$\text{Cr}_2\text{O}_7^{2-}$
(b) cyanate	$\text{OCN}^-$	(e) selenate	$\text{SeO}_4^{2-}$
(c) peroxide	$\text{O}_2^{2-}$	(f) thiosulfate	$\text{S}_2\text{O}_3^{2-}$

3. (5 points) **SHOW ALL WORK.** A certain organic amine is found to have the following percentage composition by mass: 55.02 % C, 6.46 % H, and 38.51 % N. Determine the empirical formula of this compound.

$$(55.02 \text{ g C}) (1 \text{ mole} / 12.01 \text{ g}) = 4.581 \text{ mole C}$$

$$(6.46 \text{ g H}) (1 \text{ mole} / 1.008 \text{ g}) = 6.409 \text{ mole H}$$

$$(38.51 \text{ g N}) (1 \text{ mole} / 14.07 \text{ g}) = 2.737 \text{ mole N}$$

$$\therefore \text{empirical formula is: } \text{C}_{4.581} \text{H}_{6.409} \text{N}_{2.737}$$

$$= \text{C}_{4.581/2.737} \text{H}_{6.409/2.737} \text{N}_{2.737/2.737} \quad (\text{divide by } 2.737)$$

$$= \text{C}_{1.67} \text{H}_{2.33} \text{N} = \mathbf{C_5H_7N_3} \quad (\text{multiply by } 5)$$

4. (2 points) Circle any of the following that are *ionic compounds*.



5. (10 points) Complete the following table of compound names and formulas.

Formula	Name
$Br_2O_5$	dibromine pentoxide
$V(C_2H_3O_2)_3$	vanadium(III) acetate
$MgSO_4 \cdot 7H_2O$	magnesium sulfate heptahydrate
$HClO_2(aq)$	chlorous acid
$KN_3$	potassium azide
$Hg_2(CN)_2$	mercury(I) cyanide
$Al_2(CrO_4)_3$	aluminum chromate
$H_2Te(aq)$	hydrotelluric acid
$NH_4ClO_4$	ammonium perchlorate
$XeF_6$	xenon hexafluoride

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

58	59	60	61	62	63	64	65	66	67	68	69	70	71
<b>Ce</b> 140.12	<b>Pr</b> 140.91	<b>Nd</b> 144.24	<b>Pm</b> 145.91	<b>Sm</b> 150.36	<b>Eu</b> 151.97	<b>Gd</b> 157.25	<b>Tb</b> 158.93	<b>Dy</b> 162.50	<b>Ho</b> 164.93	<b>Er</b> 167.26	<b>Tm</b> 168.93	<b>Yb</b> 173.04	<b>Lu</b> 174.97

90	91	92	93	94	95	96	97	98	99	100	101	102	103
<b>Th</b> 232.04	<b>Pa</b> 231.04	<b>U</b> 238.03	<b>Np</b> 237.05	<b>Pu</b> 244.06	<b>Am</b> 243.06	<b>Cm</b> 247.07	<b>Bk</b> 247.07	<b>Cf</b> 242.06	<b>Es</b> 252.08	<b>Fm</b> 257.10	<b>Md</b> 258.10	<b>No</b> 259.10	<b>Lr</b> 260.11