



DO NOT OPEN

UNTIL INSTRUCTED TO DO SO

CHEM 110 – Dr. McCorkle – Exam #2

While you wait, please complete the following information:

Name: _____

Student ID: _____

Turn off cellphones and stow them away. No headphones, mp3 players, hats, sunglasses, food, drinks, restroom breaks, graphing calculators, programmable calculators, or sharing calculators. Grade corrections for incorrectly marked or incompletely erased answers will not be made.

Periodic Table of the Elements

GROUP	PERIOD										18						
1	IIA										VIIIA						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIIIB	VIIIB	VIIIB	IB	IB	IIIA	IVA	VA	VIA	VIIA	0
1	H 1.01											B 10.81	C 12.01	N 14.01	O 16.00	F 19.00	He 4.00
2	Li 6.94											Al 26.98	Si 28.09	P 30.97	S 32.07	Cl 35.45	Ne 20.18
3	Na 22.99											Al 26.98	Si 28.09	P 30.97	S 32.07	Cl 35.45	Ar 39.95
4	K 39.10	Sc 44.96	Ti 47.88	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.69	Cu 63.55	Zn 65.39	Ga 69.72	Ge 72.61	As 74.92	Se 78.97	Br 79.90	Kr 83.80
5	Rb 85.47	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.95	Tc (98)	Ru 101.07	Rh 102.91	Pd 106.42	Ag 107.87	Cd 112.41	In 114.82	Sn 118.71	Sb 121.75	Te 127.60	I 126.90	Xe 131.29
6	Cs 132.91	La* 138.91	Hf 178.49	Ta 180.95	W 183.85	Re 186.21	Os 190.23	Ir 192.22	Pt 195.08	Au 196.97	Hg 200.59	Tl 204.38	Pb 207.2	Bi 208.98	Po (209)	At (210)	Rn (222)
7	Fr (223)	Ac** (227)	Rf (267)	Db (268)	Sg (271)	Bh (270)	Hs (277)	Mt (276)	Ds (281)	Rg (280)	Cn (285)	Uut (284)	Fl (289)	Uup (288)	Lv (293)	Uus (294)	Uuo (294)

GROUP	PERIOD																
1	IIA																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIIIB	VIIIB	VIIIB	IB	IB	IIIA	IVA	VA	VIA	VIIA	0
58	Ce 140.12	Pr 140.91	Nd 144.24	Pm (145)	Sm 150.36	Eu 151.96	Gd 157.25	Tb 158.93	Dy 162.50	Ho 164.93	Er 167.26	Tm 168.93	Yb 173.05	Lu 174.97			
89	Th 232.04	Pa 231.04	U 238.03	Np (237)	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (258)	No (259)	Lr (262)			

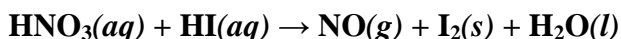
Lanthanide Series *

Actinide Series **

Multiple Choice – Choose the answer that best completes the question. Use an 815-E Scantron to record your response. [2 points each]

1. What is the molarity of a solution containing 5.0 moles of KCl in 2.0 L of solution?
A) 2.5 M B) 1.0 M C) 5.0 M D) 10. M E) 2.0 M
2. What is the molarity of a KCl solution made by diluting 75.0 mL of a 0.200 M solution to a final volume of 100. mL?
A) 0.267 M B) 0.150 M C) 0.200 M D) 6.67 M E) 0.100 M
3. Calculate the amount of solute present in 150.0 g of a 3.50% solution.
A) 0.0233 g B) 2.33 g C) 5.25 g D) 52.5 g E) 4290 mL
4. How many formula units are in 53.2 g of $(\text{NH}_4)_2\text{CrO}_4$?
A) 5.81×10^{-25} B) 1.34×10^{-20} C) 4.87×10^{27} D) 2.11×10^{23} E) 2.39×10^{23}
5. What mass in grams of phosphorus is in 72.4 g of $\text{Zn}_3(\text{PO}_4)_2$?
A) 0.0121 g B) 2.90 g C) 5.80 g D) 11.6 g E) 13.9 g

For questions 6-9, consider the following redox reaction:



6. Which element was oxidized?
A) H B) N C) O D) I
7. Which element was reduced?
A) H B) N C) O D) I
8. Which substance is the oxidizing agent?
A) HNO_3 B) HI C) NO D) I_2 E) H_2O
9. Which substance is the reducing agent?
A) HNO_3 B) HI C) NO D) I_2 E) H_2O

Calculations – Write your initials in the upper-right corner of every page that contains work. For full credit show all work and write neatly; give answers with correct significant figures and units. Place a box around your final answer.

10. Write formulas for the following compounds: [2 points each]

- a. diselenium tetrachloride

- b. hyposulfurous acid

- c. cobalt(III) chlorite

- d. zinc phosphide trihydrate

- e. tin(IV) dichromate

- f. calcium cyanide

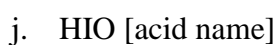
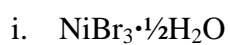
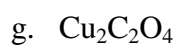
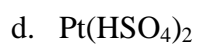
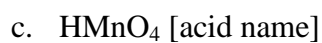
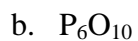
- g. pentaiodine nonaselenide

- h. lead(IV) perbromate

- i. uranium(VI) nitride

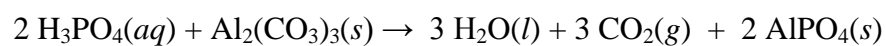
- j. hydroselenic acid

11. Name the following compounds: [2 points each]



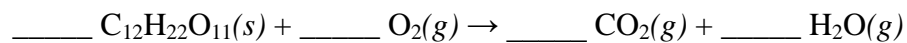
12. Determine the percentage of chromium in $\text{Ni}(\text{Cr}_2\text{O}_7)_3$. [4 points]

13. Consider the following reaction:



When 75.0 mL of 3.5 M H_3PO_4 reacts with excess $\text{Al}_2(\text{CO}_3)_3$, what mass in grams of CO_2 can be produced? [4 points]

14. Consider the following unbalanced equation for the combustion of sucrose, $C_{12}H_{22}O_{11}$:



- a. How many grams of CO_2 could be produced from the reaction of 10.0 g of $C_{12}H_{22}O_{11}$ and 10.0 g of O_2 ? [6 points]

- b. How many grams of the excess reagent will remain? [4 points]

- c. Determine the percent yield if the actual yield of CO_2 produced is 12.7 g. [2 points]

15. Dianabol is one of the anabolic steroids that has been used by some athletes to increase the size and strength of their muscles, often with serious side effects. In one experiment, 14.765 g of Dianabol is burned, and 43.257 g CO_2 and 12.395 g H_2O are formed. In a second experiment, the molar mass of Dianabol is found to be approximately 300 g/mol. What is the molecular formula for Dianabol? [8 points]

16. A 10.00 mL sample of sulfurous acid requires 14.75 mL of 0.100 *M* potassium hydroxide to titrate to the equivalence point. Determine the molarity of the sulfurous acid sample. (*Hint: Write a balanced equation.*) [6 points]

17. Predict the products and write a balanced equation for the reaction between ammonium phosphate and calcium hydroxide. Be sure to include physical states: [5 points]

18. Write the balanced full chemical equation, complete ionic equation, and net ionic equation for the reaction between titanium(IV) sulfate and lead(II) acetate. Be sure to include physical states.

a. Full Chemical Equation: [4 points]

b. Complete Ionic Equation: [4 points]

c. Net Ionic Equation: [2 points]

d. What are the spectator ions, if any? [2 points]

Extra Credit Joke: What TV show does cesium and iodine love watching together? [2 points]

**Formulas & Constants
(you may or may not need)**

1 inch = 2.54 cm (exact)

1 mile = 5280 ft \approx 1.609 km

1 kg \approx 2.205 lb

1 lb = 453.6 g; 1 lb = 16 oz

1 gal = 4 qt = 8 pt \approx 3.785 L

1 L = 1000 cm³

$T_K = T_{\text{C}} + 273.15$

$T_{\text{F}} = 1.8 \times T_{\text{C}} + 32$

$T_{\text{C}} = (T_{\text{F}} - 32)/1.8$

1 cal = 4.184 J

1 Cal = 1000 cal

$q = m \times C \times \Delta T$

Avogadro's # = 6.022×10^{23}

TABLE 4.1 Solubility Rules for Ionic Compounds in Water

Compounds Containing the Following Ions Are Generally Soluble	Exceptions
Li^+ , Na^+ , K^+ , and NH_4^+	None
NO_3^- and $\text{C}_2\text{H}_3\text{O}_2^-$	None
Cl^- , Br^- , and I^-	When these ions pair with Ag^+ , Hg_2^{2+} , or Pb^{2+} , the resulting compounds are insoluble.
SO_4^{2-}	When SO_4^{2-} pairs with Sr^{2+} , Ba^{2+} , Pb^{2+} , Ag^+ , or Ca^{2+} , the resulting compound is insoluble.
Compounds Containing the Following Ions Are Generally Insoluble	Exceptions
OH^- and S^{2-}	When these ions pair with Li^+ , Na^+ , K^+ , or NH_4^+ , the resulting compounds are soluble.
	When S^{2-} pairs with Ca^{2+} , Sr^{2+} , or Ba^{2+} , the resulting compound is soluble.
	When OH^- pairs with Ca^{2+} , Sr^{2+} , or Ba^{2+} , the resulting compound is slightly soluble.
CO_3^{2-} and PO_4^{3-}	When these ions pair with Li^+ , Na^+ , K^+ , or NH_4^+ , the resulting compounds are soluble.

Scratch Page
(to be handed in)