

Name Kely (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found.

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

1) Determine the name for NO_2

- A) nitrogen (IV) oxide
- B) nitrogen (II) oxide
- C) nitrogen tetroxide
- D) dinitrogen pentoxide
- E) nitrogen dioxide

Covalent molecule (leave out mono # prefix) oxygen + ide

1) E

2) Which of the following exists as a diatomic molecule?

- A) carbon
- B) lithium
- C) phosphorus
- D) hydrogen
- E) krypton

2) D

3) Which of the following is an ionic compound?

- A) $\text{Mg}_3(\text{PO}_4)_2$ - polyatomic ion
- B) SF_2
- C) PBr_5
- D) CH_2O
- E) Cl_2O

C + H treat as if close together in periodic table

3) A

4) Which one of the following compounds is insoluble in water?

- A) CaCl_2
- B) PbCl_2
- C) K_2CO_3
- D) NaNO_3

4) B

5) Which of the following solutions will have the highest concentration of chloride ions?

- A) 0.10 M AlCl_3 (0.10) * 3
- B) 0.10 M MgCl_2 (0.10) * 2
- C) 0.05 M CaCl_2 (0.05) * 2
- D) 0.10 M LiCl (0.10)
- E) All of these solutions have the same concentration of chloride ions.

5) A

6) What is the concentration of nitrate ions in a 0.125 M $\text{Mg}(\text{NO}_3)_2$ solution?

- A) 0.0625 M
- B) 0.250 M
- C) 0.125 M
- D) 0.160 M
- E) 0.375 M

(0.125) * 2

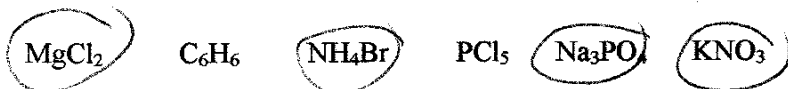
6) B

- 7) Identify the compound with covalent bonds.
A) Kr B) KBr C) Li D) NaCl E) CH₄ 7) E
- 8) Determine the molecular formula of a compound that has a molar mass of 183.2 g/mol and an empirical formula of C₂H₅O₂.
A) C₈H₂₀O₈ B) C₃H₇O₃ C) C₂H₅O₂ D) C₄H₁₀O₄ E) C₆H₁₅O₆ 8) E
- 9) An ionic bond is best described as
A) the attraction between 2 metal atoms.
 B) the transfer of electrons from one atom to another.
C) the attraction between 2 nonmetal atoms.
D) the attraction that holds the atoms together in a polyatomic ion.
E) the sharing of electrons. 9) B
- 10) Give the name for H₂SO₄.
A) persulfuric acid
B) hyposulfurous acid
C) persulfurous acid
D) sulfurous acid
 E) sulfuric acid 10) E
- 11) Calculate the molar mass for Mg(ClO₄)₂.
A) 123.76 g/mol
B) 119.52 g/mol
C) 247.52 g/mol
D) 75.76 g/mol
 E) 223.21 g/mol 11) E
- 12) Give a possible molecular formula for C₃H₅ClO.
A) C₆H₁₀O₂
B) C₅H₁₀Cl₂O₂
C) C₆H₁₀ClO₂
 D) C₆H₁₀Cl₂O₂
E) C₆H₁₂Cl₂O₂ 12) D

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (41 pts)

1. From the list of molecules shown below circle all ionic compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)



2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Ba and Cl

- a. charge on Ba +2 charge on Cl -1 (4 pts, 2 pts each)
 group # = 2 group # - 8 = -1
- b. correct formula is BaCl₂ (4 pts)



- 3 Nomenclature (4 pts, 2 pts each)

a. **penta** is the number prefix for the number 5

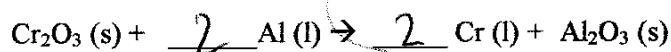
b Given the following formula of the polyatomic ions, give the name of the polyatomic ion:

NH_4^+ Ammonium

4. For the molecule $\text{Ba}(\text{NO}_3)_2$ (molar mass = 261.35 g/mol), how many moles is 1782.2 grams of the compound? (show work) (5 pts)

$$\# \text{ moles} = 1782.2 \text{ g} \times \frac{\text{Ba}(\text{NO}_3)_2}{261.35 \text{ g Ba}(\text{NO}_3)_2} = 6.8192 \text{ moles}$$

5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



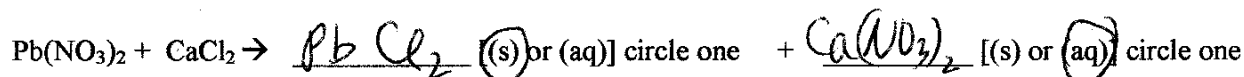
b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)



6. (a). Is the compound PbCl_2 [(soluble) or (insoluble)] (circle one) in water? (2 pt)

Cl^- soluble - exception

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) filling in the blanks and then (2) circling either (s) or (aq) by each product. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

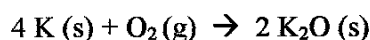


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the K_2O in moles if you start with 27.8 moles of K (s). Show work. (7 pts)



$$27.8 \text{ mole } K \times \frac{2 \text{ mol } K_2O}{4 \text{ mol } K} = 13.9 \text{ mol } K_2O$$

b. If the formula mass of K_2O is 94.20 g/mole, what is the theoretical yield in grams [based on the number of moles of K_2O from part (a)]? Show work. (6 pts)

$$13.9 \text{ mol } K_2O \times \frac{94.20 \text{ g } K_2O}{\text{mol } K_2O} = 1309.4 \text{ g } K_2O$$

3 sig fig
 $1.31 \times 10^3 \text{ g } K_2O$

or

$$27.8 \text{ mol } K \times \frac{2 \text{ mol } K_2O}{4 \text{ mol } K} \times \frac{94.20 \text{ g } K_2O}{\text{mol } K_2O} =$$

c. Your yield of the is K_2O from the number of moles of K (s) is 13.9 moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the K_2O [from the number of moles of starting O_2] is given to be 20.7 mol K_2O , which is the limiting reagent?

(K) or (O₂) (circle one) (3 pts)

K gives 13.9 K_2O
 O_2 give 20.7 mol K_2O

2. How many grams of $\text{Ba}(\text{OH})_2$ do you have in 345 mL of a 1.00 M solution? (17 pts) To answer this question, complete the following.

a. Rewrite the 1.00 M in terms of 1.00 moles in 1000 mL of solution (6 pts)

b. How many moles of $\text{Ba}(\text{OH})_2$ do you have? (4 pts) Show work.

$$345 \text{ mL} \times \frac{1.00 \text{ mol Ba}(\text{OH})_2}{1000 \text{ mL Ba}(\text{OH})_2 \text{ soln.}} = 0.345 \text{ mol Ba}(\text{OH})_2$$

c. What is the formula mass of the $\text{Ba}(\text{OH})_2$? (4 pts) Show work.

$$137.33 + (2 * 16.0) + 2(1.01) = 171.35 \text{ g Ba}(\text{OH})_2 / \text{mol Ba}(\text{OH})_2$$

d. How many grams of the $\text{Ba}(\text{OH})_2$ do you have in the 345 mL of solution? (3 pts) Show work.

$$0.345 \text{ mol Ba}(\text{OH})_2 \times \frac{171.35 \text{ g Ba}(\text{OH})_2}{\text{mol Ba}(\text{OH})_2} = 59.1 \text{ g Ba}(\text{OH})_2$$

or

$$345 \text{ mL Ba}(\text{OH})_2 \text{ soln.} \times \frac{1.00 \text{ mol Ba}(\text{OH})_2}{1000 \text{ mL Ba}(\text{OH})_2 \text{ soln.}} \times \frac{171.35 \text{ g Ba}(\text{OH})_2}{\text{mol Ba}(\text{OH})_2} =$$

↑
Same #

Orange

Name Key (print) Name _____ (sign)

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Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

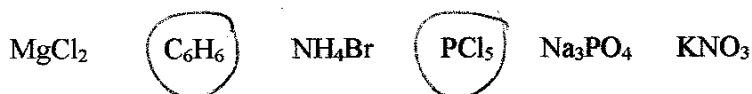
- 1) Which one of the following compounds is insoluble in water? 1) C
 A) NaNO_3 B) K_2CO_3 C) PbCl_2 D) CaCl_2
- 2) Determine the molecular formula of a compound that has a molar mass of 183.2 g/mol and an empirical formula of $\text{C}_2\text{H}_5\text{O}_2$. 2) D
 A) $\text{C}_3\text{H}_7\text{O}_3$ B) $\text{C}_8\text{H}_{20}\text{O}_8$ C) $\text{C}_2\text{H}_5\text{O}_2$ D) $\text{C}_6\text{H}_{15}\text{O}_6$ E) $\text{C}_4\text{H}_{10}\text{O}_4$
- 3) Give the name for H_2SO_4 . 3) B
 A) persulfurous acid
 B) sulfuric acid
 C) persulfuric acid
 D) sulfurous acid
 E) hyposulfurous acid
- 4) Determine the name for NO_2 . 4) A
 A) nitrogen dioxide
 B) nitrogen tetroxide
 C) dinitrogen pentoxide
 D) nitrogen (IV) oxide
 E) nitrogen (II) oxide
- 5) Which of the following solutions will have the highest concentration of chloride ions? 5) D
 A) 0.10 M LiCl
 B) 0.10 M MgCl_2
 C) 0.05 M CaCl_2
 D) 0.10 M AlCl_3
 E) All of these solutions have the same concentration of chloride ions.
- 6) Calculate the molar mass for $\text{Mg}(\text{ClO}_4)_2$. 6) A
 A) 223.21 g/mol
 B) 119.52 g/mol
 C) 247.52 g/mol
 D) 75.76 g/mol
 E) 123.76 g/mol

- 7) Give a possible molecular formula for C_3H_5ClO . 7) D
- A) $C_6H_{12}Cl_2O_2$
 - B) $C_6H_{10}O_2$
 - C) $C_6H_{10}ClO_2$
 - D) $C_6H_{10}Cl_2O_2$
 - E) $C_5H_{10}Cl_2O_2$
- 8) Which of the following exists as a diatomic molecule? 8) D
- A) phosphorus
 - B) krypton
 - C) carbon
 - D) hydrogen
 - E) lithium
- 9) An ionic bond is best described as 9) C
- A) the attraction that holds the atoms together in a polyatomic ion.
 - B) the attraction between 2 nonmetal atoms.
 - C) the transfer of electrons from one atom to another.
 - D) the sharing of electrons.
 - E) the attraction between 2 metal atoms.
- 10) Which of the following is an ionic compound? 10) B
- A) CH_2O
 - B) $Mg_3(PO_4)_2$
 - C) SF_2
 - D) PBr_5
 - E) Cl_2O
- 11) What is the concentration of nitrate ions in a 0.125 M $Mg(NO_3)_2$ solution? 11) A
- A) 0.250 M B) 0.0625 M C) 0.375 M D) 0.160 M E) 0.125 M
- 12) Identify the compound with covalent bonds. 12) D
- A) NaCl B) Kr C) Li D) CH_4 E) KBr

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

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1. From the list of molecules shown below circle all covalent compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)



2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Na and O

a. charge on Na +1 charge on O -2 (4 pts, 2 pts each)

b. correct formula is Na₂O (4 pts) where Na = # Na
0 = # Oxygen

$(+1)Na + (-2)O = 0$
 $\uparrow \quad \quad \quad \uparrow$
 $2 \quad \quad \quad 1$

3. Nomenclature (4 pts, 2 pts each)

a. **octa** is the number prefix for the number 8

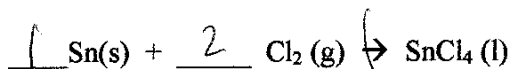
b. Given the following formula of the polyatomic ions, give the name of the polyatomic ion:

PO₄⁻³ phosphate

4. For the molecule Ba(NO₃)₂ (molar mass = 261.35 g/mol), how many moles is 82.2 grams of the compound? (show work) (5 pts)

$$82.2 \text{ g} \times \frac{1 \text{ mol Ba(NO}_3)_2}{261.35 \text{ g Ba(NO}_3)_2} = 0.315 \text{ mol Ba(NO}_3)_2$$

5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



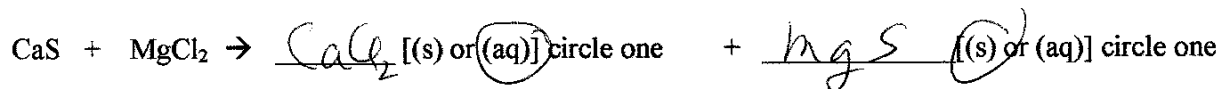
b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)



6. (a). Is the compound CaS [(soluble) or (insoluble)] (circle one) in water? (2 pt)

S⁻² insoluble, Ca⁺² is exception

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) filling in the blanks and then (2) circling either (s) or (aq) by each product. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

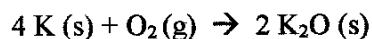


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

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1 a. For the reaction shown, what is the theoretical yield of the K_2O in moles if you start with 47.7 moles of K (s). Show work. (7 pts)



$$47.7 \text{ mol } K \times \frac{2 \text{ mol } K_2O}{4 \text{ mol } K} = 23.9 \text{ mol } K_2O$$

b. If the formula mass of K_2O is 94.20 g/mole, what is the theoretical yield in grams [based on the number of moles of K_2O from part (a)]? Show work. (6 pts)

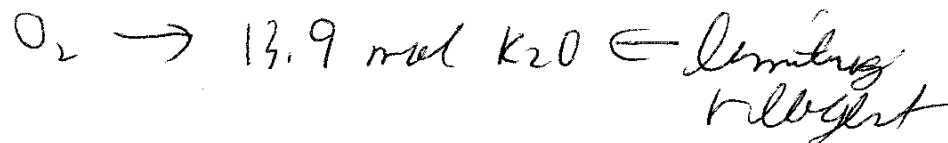
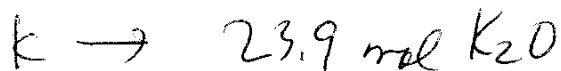
$$23.9 \text{ mol } K_2O \times \frac{94.20 \text{ g } K_2O}{\text{mol } K_2O} = 2250 \text{ g } K_2O$$

or

$$47.7 \text{ mol } K \times \frac{2 \text{ mol } K_2O}{4 \text{ mol } K} \times \frac{94.2 \text{ g } K_2O}{\text{mol } K_2O} = 2.25 \times 10^3 \text{ g } K_2O$$

c. Your yield of the K_2O from the number of moles of K (s) is 23.9 moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the K_2O [from the number of moles of starting O_2] is given to be 13.9 mol K_2O , which is the limiting reagent?

[(K) or (O₂)] (circle one) (3 pts)



2. How many grams of $(\text{NH}_4)_2\text{S}$ do you have in 15.7 mL of a 2.55 M solution? (17 pts) To answer this question, complete the following.

a. Rewrite the 2.55 M in terms of 2.55 moles in 1000 mL of solution (6 pts)

b. How many moles of $(\text{NH}_4)_2\text{S}$ do you have? (4 pts) Show work.

$$15.7 \text{ mL } (\text{NH}_4)_2\text{S} \times \frac{2.55 \text{ mol } (\text{NH}_4)_2\text{S soln}}{1000 \text{ mL } (\text{NH}_4)_2\text{S}} = 0.0400 \text{ mol } (\text{NH}_4)_2\text{S}$$

3 sig fig

c. What is the formula mass of the $(\text{NH}_4)_2\text{S}$? (4 pts) Show work.

$$2 \underset{\text{N}}{(14.01)} + 8 \underset{\text{H}}{(1.01)} + 32.07 \underset{\text{S}}{=} 68.17$$

d. How many grams of the $(\text{NH}_4)_2\text{S}$ do you have in the 15.7 mL of solution? (3 pts) Show work.

$$0.0400 \text{ mol } (\text{NH}_4)_2\text{S} \times \frac{68.17 \text{ g } (\text{NH}_4)_2\text{S}}{\text{mol } (\text{NH}_4)_2\text{S}} = 2.73 \text{ g } (\text{NH}_4)_2\text{S}$$

$$15.7 \text{ mL } (\text{NH}_4)_2\text{S soln.} \times \left[\frac{2.55 \text{ mol } (\text{NH}_4)_2\text{S}}{1000 \text{ mL } (\text{NH}_4)_2\text{S soln.}} \right] \times \left[\frac{68.17 \text{ g } (\text{NH}_4)_2\text{S}}{\text{mol } (\text{NH}_4)_2\text{S}} \right] = 2.73 \text{ g } (\text{NH}_4)_2\text{S}$$

Name Kly (print) Name _____ (sign)

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Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

1) What is the molar concentration of sodium ions in a 0.450 M Na_3PO_4 solution? 1) D
 A) 0.450 M B) 0.150 M C) 1.80 M D) 1.35 M

2) Give the name for Na_2SO_4 . 2) D
 A) sodium hydrogen sulfite
 B) sodium sulfide
 C) sodium hydrogen sulfate
 D) sodium sulfate
 E) sodium sulfite

Handwritten notes: binary ionic with polyatomic ion = sulfate
 $(0.450) * 3 =$

3) Which of the following exists as a diatomic molecule? 3) B
 A) phosphorus
 B) bromine
 C) carbon
 D) krypton
 E) lithium

Handwritten note: all halogens are diatomic

4) Which of the following solutions will have the highest concentration of chloride ions? 4) C
 A) 0.40 M CaCl_2 $-(0.40) * 2$
 B) 0.40 M MgCl_2 $-(0.40) * 2$
 C) 0.60 M AlCl_3 $-(0.60) * 3$
 D) 0.20 M LiCl $-(0.20)$
 E) All of these solutions have the same concentration of chloride ions.

5) What is the empirical formula for $\text{Hg}_2(\text{NO}_3)_2$? 5) B
 A) Hg_2NO_3
 B) HgNO_3
 C) $\text{Hg}_4(\text{NO}_3)_4$
 D) $\text{Hg}_2(\text{NO}_3)_2$
 E) $\text{Hg}(\text{NO}_3)_2$

Handwritten note: common denominator = 2

6) Which one of the following compounds is soluble in water? 6) A
 A) $\text{Pb}(\text{NO}_3)_2$ B) CoS C) ZnCO_3 D) $\text{Cu}_3(\text{PO}_4)_2$

7) Determine the molecular formula of a compound that has a molar mass of 92.0 g/mol and an empirical formula of NO_2 . (FW $\text{NO}_2 = 46.01$)

- A) NO_2 B) N_3O_6 C) N_2O_3 D) N_2O_4 E) N_2O_5

7) D

8) Give the name for HNO_3 .

- A) hydrogen nitrate
 B) nitric acid
 C) hydrogen nitrite
 D) hydrogen nitride
 E) nitrous acid

8) B

9) A covalent bond is best described as

- A) the transfer of electrons.
 B) a bond between a metal and a nonmetal.
 C) the sharing of electrons between atoms.
 D) a bond between two polyatomic ions.
 E) a bond between a metal and a polyatomic ion.

9) C

10) Which of the following is a covalent compound? (CN = polyatomic ion)

- A) SrCl_2 B) P_4O_{10} C) LiCN D) ZnS E) LiOH

10) B

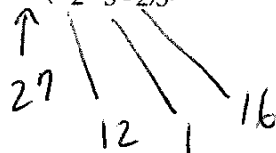
11) Identify the compound with ionic bonds.

- A) KBr B) CO C) Ne D) N_2 E) H_2O

11) A

12) Calculate the molar mass of $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$.

- A) 139.99 g/mol
 B) 204.13 g/mol
 C) 56.00 g/mol
 D) 258.09 g/mol
 E) 86.03 g/mol



12) B

$$27 + [(12 \times 2) + 3(1) + 2(16)] \times 3 =$$

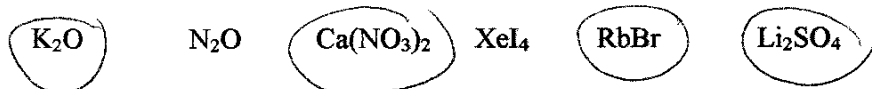
$$27 + (12 \times 6) + (3 \times 3) + (16 \times 6) =$$

$$27 + 72 + 9 + 96 = 204$$

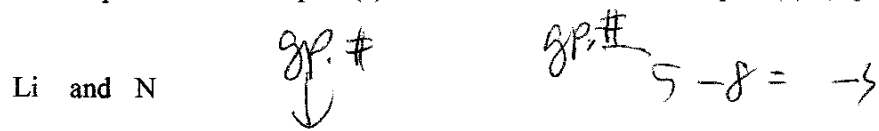
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1. From the list of molecules shown below circle all ionic compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)

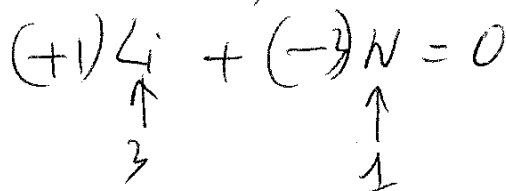


2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)



a. charge on Li +1 charge on N -3 (4 pts, 2 pts each)

b. correct formula is Li₃N (4 pts)



- 3 Nomenclature (4 pts, 2 pts each)

a. **tri** is the number prefix for the number 3

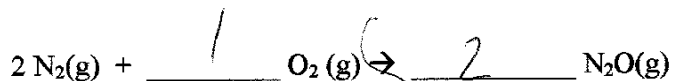
b. Given the following formula of the polyatomic ions, give the name of the polyatomic ion:



4. For the molecule CO₂ (with molar mass = 44.01 g/mol), how many moles is 24.77 grams of the compound? (show work) (5 pts)

$$24.77 \text{ g CO}_2 \times \frac{\text{CO}_2}{44.01 \text{ g CO}_2} = 0.5628 \text{ mol CO}_2$$

5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



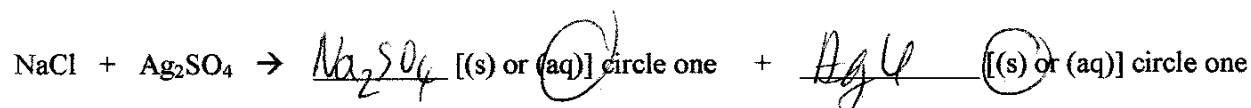
b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)

4N, 2O 4N, 2O

6. (a). Is the compound Na_2SO_4 (soluble) or (insoluble)] (circle one) in water? (2 pt)

SO₄ soluble, Na not exception

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) filling in the blanks and then (2) circling either (s) or (aq) by each product. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

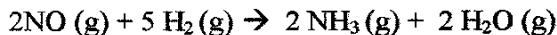


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the NH_3 in moles if you start with 88.78 moles of NO (g). Show work. (7 pts)



$$\begin{array}{c} 88.78 \\ \text{mol} \\ \text{NO} \\ \hline \end{array} \times \frac{2 \text{ mol NH}_3}{2 \text{ mol NO}} = 88.78 \text{ mol NH}_3$$

b. If the formula mass of NH_3 is 17.04 g/mole, what is the theoretical yield in grams [based on the number of moles of NH_3 from part (a)]? Show work. (6 pts)

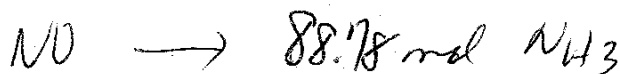
$$88.78 \text{ mol NH}_3 \times \frac{17.04 \text{ g NH}_3}{\text{mol NH}_3} = 1512.85 \text{ g NH}_3 \quad \left(\begin{array}{l} \text{w sig fig} \\ 1513 \text{ g} \end{array} \right)$$

or

$$88.78 \text{ mol NO} \times \frac{2 \text{ mol NH}_3}{2 \text{ mol NO}} \times \frac{17.04 \text{ g NH}_3}{\text{mol NH}_3} = 1512.85 \text{ g NH}_3$$

c. Your yield of the NH_3 from the number of moles of NO (g) is 88.78 moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the NH_3 [from the number of moles of starting H_2] is given to be 70.2 mol NH_3 , which is the limiting reagent?

[(NO) or (H₂)] (circle one) (3 pts)



2 If you dissolve 78.9 grams of $\text{Mg}(\text{NO}_3)_2$ in enough water to make up 225 mL of solution, what is the molarity of the solution? To answer this question, complete the following. (17 pts)

a. What is the molar mass of the $\text{Mg}(\text{NO}_3)_2$? (3 pts) Show work

$$\begin{array}{r} 24.31 \\ \text{mg} \end{array} + 2 \begin{array}{r} (14.01) \\ \text{N} \end{array} + 6 \begin{array}{r} (16.00) \\ \text{O} \end{array} = \underline{148.33 \text{ g}} \text{ mg}(\text{NO}_3)_2$$

mol $\text{Mg}(\text{NO}_3)_2$

b. How many moles of the $\text{Mg}(\text{NO}_3)_2$ do you have? (5 pts) Show work.

$$\begin{array}{r} 78.9 \text{ g} \\ \text{mg}(\text{NO}_3)_2 \end{array} \times \frac{\text{mol mg}(\text{NO}_3)_2}{148.33 \text{ g mg}(\text{NO}_3)_2} = 0.532 \text{ mol mg}(\text{NO}_3)_2$$

c. How many Liters of the solution do you have? (4 pts) Show work.

$$\begin{array}{r} 225 \text{ mL} \\ \text{soln} \end{array} \times \frac{1 \text{ L soln}}{1000 \text{ mL soln}} = 0.225 \text{ L soln.}$$

d. What is the molarity of the $\text{Mg}(\text{NO}_3)_2$ solution? (5 pts) Show work.

$$\text{M mg}(\text{NO}_3)_2 = \frac{0.532 \text{ mol mg}(\text{NO}_3)_2}{0.225 \text{ L soln}} = 2.36 \text{ M}$$

Green

Exam II General Chemistry I Lecture Spring 2014 3/4/14 Tuesday form 9:55 B Dr. Hahn Exam # _____

Name Key (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found.

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

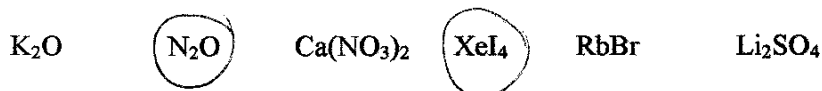
- 1) Which of the following is a covalent compound? 1) D
A) LiOH B) ZnS C) LiCN D) P₄O₁₀ E) SrCl₂
- 2) Which of the following solutions will have the highest concentration of chloride ions? 2) A
A) 0.60 M AlCl₃
B) 0.40 M CaCl₂
C) 0.40 M MgCl₂
D) 0.20 M LiCl
E) All of these solutions have the same concentration of chloride ions.
- 3) What is the empirical formula for Hg₂(NO₃)₂? 3) C
A) Hg₂NO₃
B) Hg₄(NO₃)₄
C) HgNO₃
D) Hg₂(NO₃)₂
E) Hg(NO₃)₂
- 4) Identify the compound with ionic bonds. 4) E
A) Ne B) CO C) N₂ D) H₂O E) KBr
- 5) A covalent bond is best described as 5) C
A) a bond between a metal and a polyatomic ion.
B) a bond between a metal and a nonmetal.
C) the sharing of electrons between atoms.
D) the transfer of electrons.
E) a bond between two polyatomic ions.
- 6) Determine the name for NO₂. 6) B
A) nitrogen tetroxide
B) nitrogen dioxide
C) dinitrogen pentoxide
D) nitrogen (II) oxide
E) nitrogen (IV) oxide
- 7) What is the molar concentration of sodium ions in a 0.450 M Na₃PO₄ solution? 7) C
A) 0.450 M B) 0.150 M C) 1.35 M D) 1.80 M

- 8) Calculate the molar mass of $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$. 8) B
- A) 86.03 g/mol
B) 204.13 g/mol
C) 258.09 g/mol
D) 56.00 g/mol
E) 139.99 g/mol
- 9) Give the name for HNO_3 . 9) A
- A) nitric acid
B) hydrogen nitride
C) hydrogen nitrite
D) nitrous acid
E) hydrogen nitrate
- 10) Determine the molecular formula of a compound that has a molar mass of 92.0 g/mol and an empirical formula of NO_2 . 10) D
- (FW $\text{NO}_2 = 46.01$)
- A) NO_2 B) N_2O_5 C) N_3O_6 D) N_2O_4 E) N_2O_3
- 11) Which of the following exists as a diatomic molecule? 11) E
- A) carbon
B) krypton
C) phosphorus
D) lithium
E) bromine
- 12) Which one of the following compounds is soluble in water? 12) C
- A) ZnCO_3 B) CoS C) $\text{Pb}(\text{NO}_3)_2$ D) $\text{Cu}_3(\text{PO}_4)_2$

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (41 pts)

1. From the list of molecules shown below circle all covalent compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)

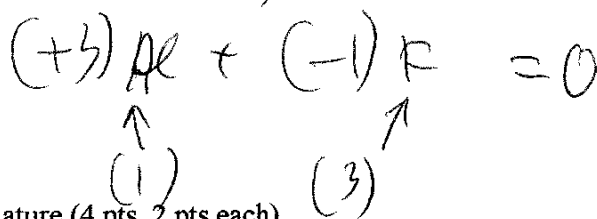


2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Al and F

- a. charge on Al +3 charge on F -1 (4 pts, 2 pts each)
group # *group # - 8 = -1*

- b. correct formula is AlF₃ (4 pts)



- 3 Nomenclature (4 pts, 2 pts each)

- a. **hexa** is the number prefix for the number 6

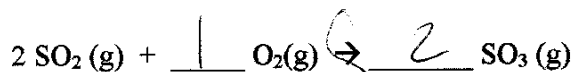
- b. Given the following formula of the polyatomic ions, give the name of the polyatomic ion:



4. For the molecule CO₂ (with molar mass = 44.01 g/mol), how many moles is 17.99 grams of the compound? (show work) (5 pts)

$$17.99 \text{ g CO}_2 \times \frac{\text{mol CO}_2}{44.01 \text{ g CO}_2} = 0.4088 \text{ mol CO}_2$$

5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



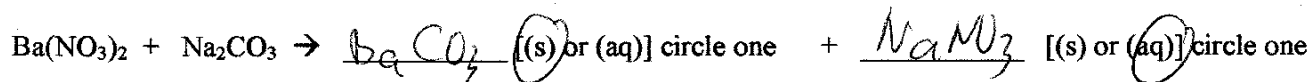
b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)

2S, 4O, 2O 2S, 6O

6. (a). Is the compound BaCO_3 [(soluble) or (insoluble)] (circle one) in water? (2 pt)

insoluble + not exception

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) filling in the blanks and then (2) circling either (s) or (aq) by each product. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

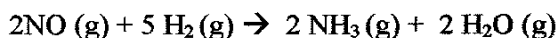


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the NH_3 in moles if you start with 58.7 moles of NO (g). Show work. (7 pts)



$$58.7 \text{ mol NO(g)} \times \frac{2 \text{ mol NH}_3}{2 \text{ mol NO}} = 58.7 \text{ mol NH}_3$$

b. If the formula mass of NH_3 is 17.04 g/mole, what is the theoretical yield in grams [based on the number of moles of NH_3 from part (a)]? Show work. (6 pts)

$$58.7 \text{ mol NH}_3 \times \frac{17.04 \text{ g NH}_3}{\text{mol NH}_3} = 1000.2 \frac{3 \text{ sig fig}}{1.00 \times 10^3}$$

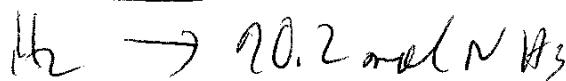
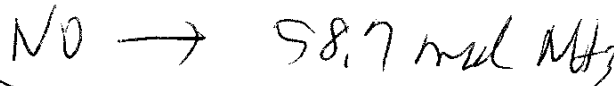
or

$$58.7 \text{ mol NO} \times \frac{2 \text{ mol NH}_3}{2 \text{ mol NO}} \times \frac{17.04 \text{ g NH}_3}{\text{mol NH}_3} =$$

g
 NH_3

c. Your yield of the NH_3 from the number of moles of NO (g) is 58.7 moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the NH_3 [from the number of moles of starting H_2] is given to be 70.2 mol NH_3 , which is the limiting reagent?

(NO) or (H_2) (circle one) (3 pts)



limiting reagent

2 If you dissolve 78.9 grams of $B(OH)_3$ in enough water to make up 788 mL of solution, what is the molarity of the solution? To answer this question, you are going to answer (a) through (d) (17 pts)

(a) What is the molar mass of the $B(OH)_3$? (3 pts) Show work

$$\underset{B}{10.81} + \underset{O}{(16.0)}_3 + \underset{H}{(1.01)}_3 = 61.84 \text{ g} / \text{mol } B(OH)_3$$

(b) How many moles of the $B(OH)_3$ do you have? (5 pts) Show work.

$$78.9 \text{ g } B(OH)_3 \times \frac{1 \text{ mol } B(OH)_3}{61.84 \text{ g } B(OH)_3} = 1.28 \text{ mol } B(OH)_3$$

(c) How many Liters of the solution do you have? (4 pts) Show work.

$$788 \text{ mL soln} \times \frac{1 \text{ L soln}}{1000 \text{ mL soln}} = 0.788 \text{ L}$$

(d) What is the molarity of the $B(OH)_3$ solution? (5 pts) Show work.

$$M_{B(OH)_3 \text{ soln}} = \frac{1.28 \text{ mol } B(OH)_3}{0.788 \text{ L } B(OH)_3 \text{ soln}} = 1.62 \text{ M } B(OH)_3$$

or

$$\left(\frac{78.9 \text{ g}}{788 \text{ mL}} \right) \times \left(\frac{1 \text{ mol}}{61.84 \text{ g}} \right) \times \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right)$$

Name _____ (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found.

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

- 1) Determine the name for NO_2 . 1) _____
A) nitrogen (IV) oxide
B) nitrogen (II) oxide
C) nitrogen tetroxide
D) dinitrogen pentoxide
E) nitrogen dioxide
- 2) Which of the following exists as a diatomic molecule? 2) _____
A) carbon
B) lithium
C) phosphorus
D) hydrogen
E) krypton
- 3) Which of the following is an ionic compound? 3) _____
A) $\text{Mg}_3(\text{PO}_4)_2$
B) SF_2
C) PBr_5
D) CH_2O
E) Cl_2O
- 4) Which one of the following compounds is insoluble in water? 4) _____
A) CaCl_2 B) PbCl_2 C) K_2CO_3 D) NaNO_3
- 5) Which of the following solutions will have the highest concentration of chloride ions? 5) _____
A) 0.10 M AlCl_3
B) 0.10 M MgCl_2
C) 0.05 M CaCl_2
D) 0.10 M LiCl
E) All of these solutions have the same concentration of chloride ions.
- 6) What is the concentration of nitrate ions in a 0.125 M $\text{Mg}(\text{NO}_3)_2$ solution? 6) _____
A) 0.0625 M B) 0.250 M C) 0.125 M D) 0.160 M E) 0.375 M

- 7) Identify the compound with covalent bonds. 7) _____
A) Kr B) KBr C) Li D) NaCl E) CH₄
- 8) Determine the molecular formula of a compound that has a molar mass of 183.2 g/mol and an empirical formula of C₂H₅O₂. 8) _____
A) C₈H₂₀O₈ B) C₃H₇O₃ C) C₂H₅O₂ D) C₄H₁₀O₄ E) C₆H₁₅O₆
- 9) An ionic bond is best described as 9) _____
A) the attraction between 2 metal atoms.
B) the transfer of electrons from one atom to another.
C) the attraction between 2 nonmetal atoms.
D) the attraction that holds the atoms together in a polyatomic ion.
E) the sharing of electrons.
- 10) Give the name for H₂SO₄. 10) _____
A) persulfuric acid
B) hyposulfurous acid
C) persulfurous acid
D) sulfurous acid
E) sulfuric acid
- 11) Calculate the molar mass for Mg(ClO₄)₂. 11) _____
A) 123.76 g/mol
B) 119.52 g/mol
C) 247.52 g/mol
D) 75.76 g/mol
E) 223.21 g/mol
- 12) Give a possible molecular formula for C₃H₅ClO. 12) _____
A) C₆H₁₀O₂
B) C₅H₁₀Cl₂O₂
C) C₆H₁₀ClO₂
D) C₆H₁₀Cl₂O₂
E) C₆H₁₂Cl₂O₂

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (41 pts)

1. From the list of molecules shown below circle all ionic compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)

MgCl₂ C₆H₆ NH₄Br PCl₅ Na₃PO₄ KNO₃

2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Ba and Cl

- a. charge on Ba _____ charge on Cl _____ (4 pts, 2 pts each)
- b. correct formula is _____ (4 pts)

- 3 Nomenclature (4 pts, 2 pts each)

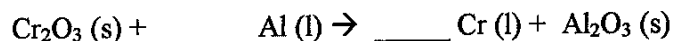
a. **penta** is the number prefix for the number _____

b Given the following formula of the polyatomic ions, give the name of the polyatomic ion:

NH₄⁺ _____

4. For the molecule Ba(NO₃)₂ (molar mass = 261.35 g/mol), how many moles is 1782.2 grams of the compound? (show work) (5 pts)

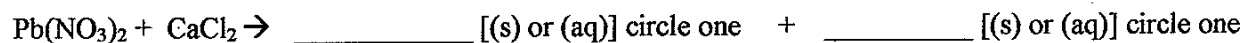
5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit.(4 pts)

6. (a). Is the compound PbCl_2 [(soluble) or (insoluble)] (circle one) in water? (2 pt)

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) **filling in the blanks** and then (2) **circling either (s) or (aq) by each product**. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

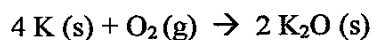


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

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Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the K_2O in moles if you start with 27.8 moles of K (s). Show work. (7 pts)



b. If the formula mass of K_2O is 94.20 g/mole, what is the theoretical yield in grams [based on the number of moles of K_2O from part (a)]? Show work. (6 pts)

c. Your yield of the K_2O from the number of moles of K (s) is _____ moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the K_2O [from the number of moles of starting O_2] is given to be 20.7 mol K_2O , which is the limiting reagent ?

[(K) or (O_2)] (circle one) (3 pts)

2. How many grams of $\text{Ba}(\text{OH})_2$ do you have in 345 mL of a 1.00 M solution? (17 pts) To answer this question, complete the following.
- Rewrite the 1.00 M in terms of _____ moles in _____ mL of solution (6 pts)
 - How many moles of $\text{Ba}(\text{OH})_2$ do you have? (4 pts) Show work.
 - What is the formula mass of the $\text{Ba}(\text{OH})_2$? (4 pts) Show work.
 - How many grams of the $\text{Ba}(\text{OH})_2$ do you have in the 345 mL of solution? (3 pts) Show work.

Name _____ (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found.

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.
No partial credit for MC. (2 pts per question, 24 pts total)

- 1) Which one of the following compounds is insoluble in water? 1) _____
A) NaNO_3 B) K_2CO_3 C) PbCl_2 D) CaCl_2
- 2) Determine the molecular formula of a compound that has a molar mass of 183.2 g/mol and an empirical formula of $\text{C}_2\text{H}_5\text{O}_2$. 2) _____
A) $\text{C}_3\text{H}_7\text{O}_3$ B) $\text{C}_8\text{H}_{20}\text{O}_8$ C) $\text{C}_2\text{H}_5\text{O}_2$ D) $\text{C}_6\text{H}_{15}\text{O}_6$ E) $\text{C}_4\text{H}_{10}\text{O}_4$
- 3) Give the name for H_2SO_4 . 3) _____
A) persulfurous acid
B) sulfuric acid
C) persulfuric acid
D) sulfurous acid
E) hyposulfurous acid
- 4) Determine the name for NO_2 . 4) _____
A) nitrogen dioxide
B) nitrogen tetroxide
C) dinitrogen pentoxide
D) nitrogen (IV) oxide
E) nitrogen (II) oxide
- 5) Which of the following solutions will have the highest concentration of chloride ions? 5) _____
A) 0.10 M LiCl
B) 0.10 M MgCl_2
C) 0.05 M CaCl_2
D) 0.10 M AlCl_3
E) All of these solutions have the same concentration of chloride ions.
- 6) Calculate the molar mass for $\text{Mg}(\text{ClO}_4)_2$. 6) _____
A) 223.21 g/mol
B) 119.52 g/mol
C) 247.52 g/mol
D) 75.76 g/mol
E) 123.76 g/mol

- 7) Give a possible molecular formula for C_3H_5ClO . 7) _____
A) $C_6H_{12}Cl_2O_2$
B) $C_6H_{10}O_2$
C) $C_6H_{10}ClO_2$
D) $C_6H_{10}Cl_2O_2$
E) $C_5H_{10}Cl_2O_2$
- 8) Which of the following exists as a diatomic molecule? 8) _____
A) phosphorus
B) krypton
C) carbon
D) hydrogen
E) lithium
- 9) An ionic bond is best described as 9) _____
A) the attraction that holds the atoms together in a polyatomic ion.
B) the attraction between 2 nonmetal atoms.
C) the transfer of electrons from one atom to another.
D) the sharing of electrons.
E) the attraction between 2 metal atoms.
- 10) Which of the following is an ionic compound? 10) _____
A) CH_2O
B) $Mg_3(PO_4)_2$
C) SF_2
D) PBr_5
E) Cl_2O
- 11) What is the concentration of nitrate ions in a 0.125 M $Mg(NO_3)_2$ solution? 11) _____
A) 0.250 M B) 0.0625 M C) 0.375 M D) 0.160 M E) 0.125 M
- 12) Identify the compound with covalent bonds. 12) _____
A) NaCl B) Kr C) Li D) CH_4 E) KBr

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (41 pts)

1. From the list of molecules shown below circle all covalent compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)

MgCl₂ C₆H₆ NH₄Br PCl₅ Na₃PO₄ KNO₃

2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Na and O

- a. charge on Na _____ charge on O _____ (4 pts, 2 pts each)
b. correct formula is _____ (4 pts)

- 3 Nomenclature (4 pts, 2 pts each)

a. **octa** is the number prefix for the number _____

b Given the following formula of the polyatomic ions, give the name of the polyatomic ion:

PO₄⁻³ _____

4. For the molecule Ba(NO₃)₂ (molar mass = 261.35 g/mol), how many moles is 82.2 grams of the compound? (show work) (5 pts)

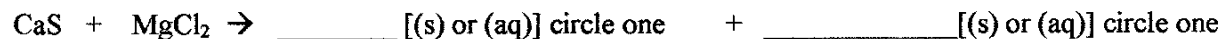
5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)

6. (a). Is the compound CaS [(soluble) or (insoluble)] (circle one) in water? (2 pt)

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) filling in the blanks and then (2) circling either (s) or (aq) by each product. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

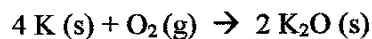


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the K_2O in moles if you start with 47.7 moles of K (s). Show work. (7 pts)



b. If the formula mass of K_2O is 94.20 g/mole, what is the theoretical yield in grams [based on the number of moles of K_2O from part (a)]? Show work. (6 pts)

c. Your yield of the is K_2O from the number of moles of K (s) is _____ moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the K_2O [from the number of moles of starting O_2] is given to be 13.9 mol K_2O , which is the limiting reagent ?

[(K) or (O_2)] (circle one) (3 pts)

2. How many grams of $(\text{NH}_4)_2\text{S}$ do you have in 15.7 mL of a 2.55 M solution? (17 pts) To answer this question, complete the following.

a. Rewrite the 2.55 M in terms of _____ moles in _____ mL of solution (6 pts)

b. How many moles of $(\text{NH}_4)_2\text{S}$ do you have? (4 pts) Show work.

c. What is the formula mass of the $(\text{NH}_4)_2\text{S}$? (4 pts) Show work.

d. How many grams of the $(\text{NH}_4)_2\text{S}$ do you have in the 15.7 mL of solution? (3 pts) Show work.

Name _____ (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found.

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

- 1) What is the molar concentration of sodium ions in a 0.450 M Na_3PO_4 solution? 1) _____
A) 0.450 M B) 0.150 M C) 1.80 M D) 1.35 M
- 2) Give the name for Na_2SO_4 . 2) _____
A) sodium hydrogen sulfite
B) sodium sulfide
C) sodium hydrogen sulfate
D) sodium sulfate
E) sodium sulfite
- 3) Which of the following exists as a diatomic molecule? 3) _____
A) phosphorus
B) bromine
C) carbon
D) krypton
E) lithium
- 4) Which of the following solutions will have the highest concentration of chloride ions? 4) _____
A) 0.40 M CaCl_2
B) 0.40 M MgCl_2
C) 0.60 M AlCl_3
D) 0.20 M LiCl
E) All of these solutions have the same concentration of chloride ions.
- 5) What is the empirical formula for $\text{Hg}_2(\text{NO}_3)_2$? 5) _____
A) Hg_2NO_3
B) HgNO_3
C) $\text{Hg}_4(\text{NO}_3)_4$
D) $\text{Hg}_2(\text{NO}_3)_2$
E) $\text{Hg}(\text{NO}_3)_2$
- 6) Which one of the following compounds is soluble in water? 6) _____
A) $\text{Pb}(\text{NO}_3)_2$ B) CoS C) ZnCO_3 D) $\text{Cu}_3(\text{PO}_4)_2$

- 7) Determine the molecular formula of a compound that has a molar mass of 92.0 g/mol and an empirical formula of NO_2 . 7) _____
A) NO_2 B) N_3O_6 C) N_2O_3 D) N_2O_4 E) N_2O_5
- 8) Give the name for HNO_3 . 8) _____
A) hydrogen nitrate
B) nitric acid
C) hydrogen nitrite
D) hydrogen nitride
E) nitrous acid
- 9) A covalent bond is best described as 9) _____
A) the transfer of electrons.
B) a bond between a metal and a nonmetal.
C) the sharing of electrons between atoms.
D) a bond between two polyatomic ions.
E) a bond between a metal and a polyatomic ion.
- 10) Which of the following is a covalent compound? 10) _____
A) SrCl_2 B) P_4O_{10} C) LiCN D) ZnS E) LiOH
- 11) Identify the compound with ionic bonds. 11) _____
A) KBr B) CO C) Ne D) N_2 E) H_2O
- 12) Calculate the molar mass of $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$. 12) _____
A) 139.99 g/mol
B) 204.13 g/mol
C) 56.00 g/mol
D) 258.09 g/mol
E) 86.03 g/mol

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (41 pts)

1. From the list of molecules shown below circle all ionic compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)

K_2O N_2O $Ca(NO_3)_2$ XeI_4 $RbBr$ Li_2SO_4

2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Li and N

- a. charge on Li _____ charge on N _____ (4 pts, 2 pts each)
b. correct formula is _____ (4 pts)

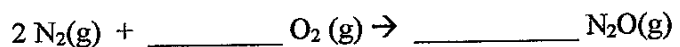
3 Nomenclature (4 pts, 2 pts each)

- a. tri is the number prefix for the number _____
b. Given the following formula of the polyatomic ions, give the name of the polyatomic ion:

CH_3COO^- (also can be written $C_2H_3O_2^-$) _____

4. For the molecule CO_2 (with molar mass = 44.01 g/mol), how many moles is 24.77 grams of the compound? (show work) (5 pts)

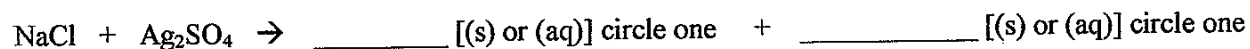
5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)

6. (a). Is the compound Na_2SO_4 [(soluble) or (insoluble)] (circle one) in water? (2 pt)

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) **filling in the blanks** and then (2) **circling either (s) or (aq) by each product**. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

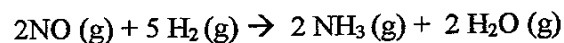


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything. ****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the NH_3 in moles if you start with 88.78 moles of NO (g). Show work. (7 pts)



b. If the formula mass of NH_3 is 17.04 g/mole, what is the theoretical yield in grams [based on the number of moles of NH_3 from part (a)]? Show work. (6 pts)

c. Your yield of the NH_3 from the number of moles of NO (g) is _____ moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the NH_3 [from the number of moles of starting H_2] is given to be 70.2 mol NH_3 , which is the limiting reagent ?

[(NO) or (H_2)] (circle one) (3 pts)

2 If you dissolve 78.9 grams of $\text{Mg}(\text{NO}_3)_2$ in enough water to make up 225 mL of solution, what is the molarity of the solution? To answer this question, complete the following. (17 pts)

a. What is the molar mass of the $\text{Mg}(\text{NO}_3)_2$? (3 pts) Show work

b. How many moles of the $\text{Mg}(\text{NO}_3)_2$ do you have? (5 pts) Show work.

c. How many Liters of the solution do you have? (4 pts) Show work.

d. What is the molarity of the $\text{Mg}(\text{NO}_3)_2$ solution? (5 pts) Show work.

Name _____ (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found.

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts total)

- 1) Which of the following is a covalent compound? 1) _____
A) LiOH B) ZnS C) LiCN D) P₄O₁₀ E) SrCl₂
- 2) Which of the following solutions will have the highest concentration of chloride ions? 2) _____
A) 0.60 M AlCl₃
B) 0.40 M CaCl₂
C) 0.40 M MgCl₂
D) 0.20 M LiCl
E) All of these solutions have the same concentration of chloride ions.
- 3) What is the empirical formula for Hg₂(NO₃)₂? 3) _____
A) Hg₂NO₃
B) Hg₄(NO₃)₄
C) HgNO₃
D) Hg₂(NO₃)₂
E) Hg(NO₃)₂
- 4) Identify the compound with ionic bonds. 4) _____
A) Ne B) CO C) N₂ D) H₂O E) KBr
- 5) A covalent bond is best described as 5) _____
A) a bond between a metal and a polyatomic ion.
B) a bond between a metal and a nonmetal.
C) the sharing of electrons between atoms.
D) the transfer of electrons.
E) a bond between two polyatomic ions.
- 6) Determine the name for NO₂. 6) _____
A) nitrogen tetroxide
B) nitrogen dioxide
C) dinitrogen pentoxide
D) nitrogen (II) oxide
E) nitrogen (IV) oxide
- 7) What is the molar concentration of sodium ions in a 0.450 M Na₃PO₄ solution? 7) _____
A) 0.450 M B) 0.150 M C) 1.35 M D) 1.80 M

- 8) Calculate the molar mass of $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$. 8) _____
A) 86.03 g/mol
B) 204.13 g/mol
C) 258.09 g/mol
D) 56.00 g/mol
E) 139.99 g/mol
- 9) Give the name for HNO_3 . 9) _____
A) nitric acid
B) hydrogen nitride
C) hydrogen nitrite
D) nitrous acid
E) hydrogen nitrate
- 10) Determine the molecular formula of a compound that has a molar mass of 92.0 g/mol and an empirical formula of NO_2 . 10) _____
A) NO_2 B) N_2O_5 C) N_3O_6 D) N_2O_4 E) N_2O_3
- 11) Which of the following exists as a diatomic molecule? 11) _____
A) carbon
B) krypton
C) phosphorus
D) lithium
E) bromine
- 12) Which one of the following compounds is soluble in water? 12) _____
A) ZnCO_3 B) CoS C) $\text{Pb}(\text{NO}_3)_2$ D) $\text{Cu}_3(\text{PO}_4)_2$

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (41 pts)

1. From the list of molecules shown below circle all covalent compounds. I am asking you to circle (or to not circle) the entire compound not parts of a compound formula. (6 pts, 1 pt each)

K_2O N_2O $Ca(NO_3)_2$ XeI_4 $RbBr$ Li_2SO_4

2. Write the correct ionic formula for the following elements. If you show work you may earn some partial credit on part (a). You must show work for part (b) (8 pts total)

Al and F

a. charge on Al _____ charge on F _____ (4 pts, 2 pts each)

b. correct formula is _____ (4 pts)

- 3 Nomenclature (4 pts, 2 pts each)

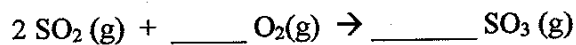
a. **hexa** is the number prefix for the number _____

b. Given the following formula of the polyatomic ions, give the name of the polyatomic ion:

NO_3^- _____

4. For the molecule CO_2 (with molar mass = 44.01 g/mol), how many moles is 17.99 grams of the compound? (show work) (5 pts)

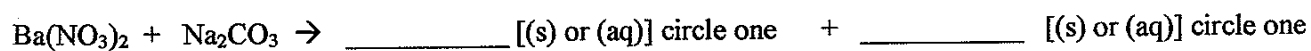
5 a. Balance the following reaction by filling in the blanks. (4 pts, 2 pts per blank)



b. Please show how many of each type of atom is in both sides of the equation after you complete balancing the reaction for full credit. (4 pts)

6. (a). Is the compound BaCO_3 [(soluble) or (insoluble)] (circle one) in water? (2 pt)

(b) Write out the molecular form of the following precipitation reaction giving the expected products by (1) filling in the blanks and then (2) circling either (s) or (aq) by each product. The reaction does not need to be balanced. (8 pts, 3 pt each blank, 1 pt each circling)

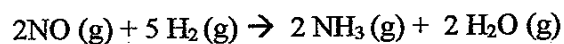


Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1 a. For the reaction shown, what is the theoretical yield of the NH_3 in moles if you start with 58.7 moles of NO (g). Show work. (7 pts)



b. If the formula mass of NH_3 is 17.04 g/mole, what is the theoretical yield in grams [based on the number of moles of NH_3 from part (a)]? Show work. (6 pts)

c. Your yield of the NH_3 from the number of moles of NO (g) is _____ moles (1 pt) [from your calculated results from part (a)]. If your number of moles of the NH_3 [from the number of moles of starting H_2] is given to be 70.2 mol NH_3 , which is the limiting reagent ?

[(NO) or (H_2)] (circle one) (3 pts)

2 If you dissolve 78.9 grams of $B(OH)_3$ in enough water to make up 788 mL of solution, what is the molarity of the solution? To answer this question, you are going to answer (a) through (d) (17 pts)

(a) What is the molar mass of the $B(OH)_3$? (3 pts) Show work

(b) How many moles of the $B(OH)_3$ do you have? (5 pts) Show work.

(c) How many Liters of the solution do you have? (4 pts) Show work.

(d) What is the molarity of the $B(OH)_3$ solution? (5 pts) Show work.