

Exam Three
CHM 203 (Dr. Mattson)
4 October 2006

Academic Integrity Pledge:

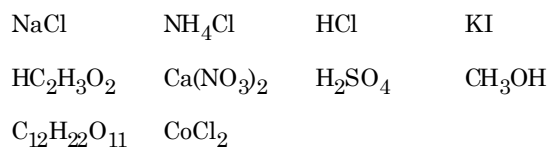
In keeping with Creighton University's ideals and with the Academic Integrity Code adopted by the College of Arts and Sciences, I pledge that this work is my own and that I have neither given nor received inappropriate assistance in preparing it.

Signature: _____

Instructions: Show all work whenever a calculation is required! You will receive credit for how you worked each problem as well as for the correct answer. This exam is worth 100 points. **BOX YOUR ANSWERS!**

1. (2 pts) I have read and signed the Academic Integrity Statement. Circle: YES

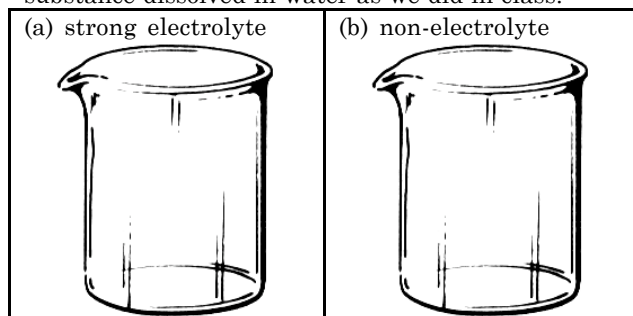
2(a). (10 points) Circle those compounds that would produce a strong electrolytic solution in water. All of these compounds dissolve in water.



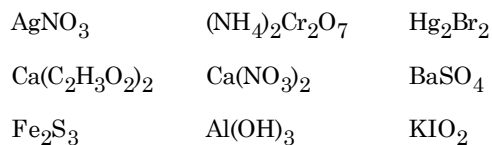
2(b). (2 pts) How did we test solutions to determine if they formed strong electrolytes?

2(c). (2 pts) Only one of the compounds listed in 2(a) produces a weak electrolytic solution in water. Which one is it?

2(d). (6 pts) Pick one strong electrolyte and one non-electrolyte from the list in 2(a) and sketch the substance dissolved in water as we did in class.



3. (9 points) Only five of these salts are soluble in water. Find and circle them.



4. (8 pts) Will a precipitate form when the following pairs of aqueous solutions are mixed? If you answer YES, give the formula of the precipitate formed. (See example.)

(Ex.) manganese(II) sulfate and sodium phosphate
 YES NO $MnSO_4$ Na_3PO_4

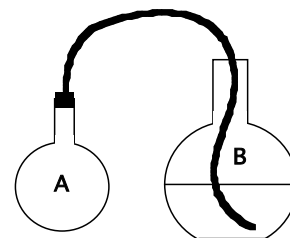
(a) ammonium sulfide and calcium bromide
 YES NO

(b) ammonium carbonate and lead(II) nitrate
 YES NO

(c) barium chloride and sodium nitrate
 YES NO

(d) nickel(II) sulfate and sodium hydroxide
 YES NO

5. A 1-L flask (Flask A) was equipped with a 1-hole stopper connected to a gas delivery tube. The other end of the gas delivery tube was placed in 4-L flask (Flask B) containing 2



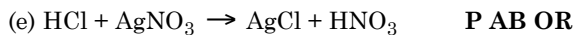
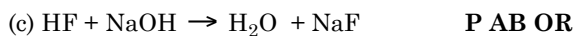
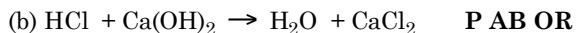
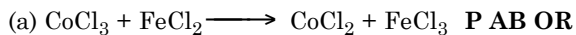
L water. Approximately 25 mL nitric acid was added to Flask A followed by two copper pennies. The flask was immediately fitted with the stopper/delivery tube. Flask A filled with red nitrogen dioxide gas and bubbles were observed coming from the delivery tube in Flask B. After some time, the bubbling subsided, then stopped. The new solution in Flask A was blue in color due to copper(II). At the bottom of Flask A, two very small copper discs remained.

5(a) (2 pt) What kind of a reaction was observed?
 (A) acid-base (B) precipitation
 (C) redox (D) none of these

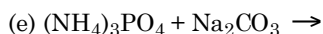
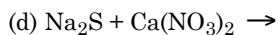
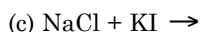
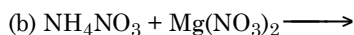
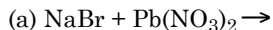
5(b) (2 pt) Which statement is true?
 (A) Nitric acid is the acid and copper is the base in this acid-base reaction.
 (B) Copper nitrate was precipitated in this precipitation reaction.
 (C) Copper was oxidized in this redox reaction.
 (D) Copper was the oxidizing reagent in this redox reaction.

5(c) (2 pts) What was the limiting reagent?
 (A) nitric acid (B) copper
 (C) water (D) no limiting reagent

6. (10 pts) Identify each of these *unbalanced* reactions as Precipitation (**P**), Acid-Base (**AB**), or oxidation-reduction (**OR**). All are aqueous.



7. (10 pts) Which pair of reagents, when mixed will **not** react with each other? Circle all that apply.



8(a). (2 pts) Write and balance the overall precipitation reaction that takes place between aqueous lead nitrate and aqueous potassium iodide.

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8(b). (2 pts) From your answer in 8(a), write and balance the ionic equation.

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8(c). (2 pts) From your answer in 8(b), write and balance the net ionic equation.

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9(a). (5 pts) Only the first of these acids (HF) has ever been made, however we can name them all based on analogy to the chlorine series. Name them.

Name	Formula
	HF
	HFO
	HFO ₂
	HFO ₃
	HFO ₄

9(b). (4 pts) Print the names for these salts.

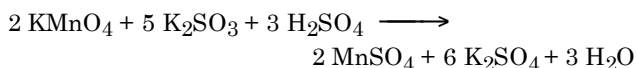
Name	Formula
	KClO
	KClO ₂
	KClO ₃

	KClO ₄
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10. (5 pts) Assign oxidation numbers to the phosphorus in each of these compounds.

(a) P ₂ O ₅	(b) K ₃ PO ₄
(c) PH ₃	(d) H ₃ PO ₃
(e) P ₄	

11. Potassium permanganate reacts with as shown:



11(a) (1 pt) The species that is oxidized is:

- A. KMnO₄ B. K₂SO₃ C. MnSO₄ D. K₂SO₄

11(b) (1 pt) The reducing agent is:

- A. KMnO₄ B. K₂SO₃ C. MnSO₄ D. K₂SO₄

11(c) (5 pt) What volume of 0.240 M KMnO₄ is required to react completely according to the stoichiometry with 100.0 mL 0.190 M K₂SO₃?

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12 Suppose 100.0 mL of 0.140 M Na₂SO₄ are added to 100 mL 0.100 M Ba(NO₃)₂.

12(a) (3 pts) What mass of barium sulfate is expected?

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12(b) (4 pts) How many moles of each ion remain in solution? [Note: Missing ion charges = points lost.]

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13. (1 pts) Print your name here:

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Your exam score (100 possible): _____

Determine your grade:

A+ ≥ 95; A ≥ 90; B+ ≥ 85; B ≥ 80; C+ ≥ 75; C ≥ 70; D ≥ 60

Answers:

2(a). Circle: NaCl, NH₄Cl, HCl, KI, Ca(NO₃)₂, H₂SO₄, and CoCl₂

2(b). We used a conductivity light and noted that strong electrolytes made the light shine brightly.

2(c). HC₂H₃O₂

2(d). Strong electrolyte: For example, NaCl: Sketch should have shown Na⁺ and Cl⁻ ions in the beaker of water. The right beaker contained a non-electrolyte, for example, C₁₂H₂₂O₁₁ and these molecules should have been shown as C₁₂H₂₂O₁₁ floating around as in the solution.

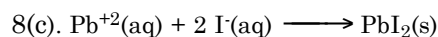
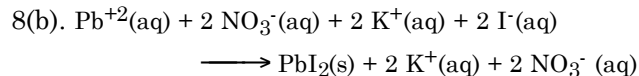
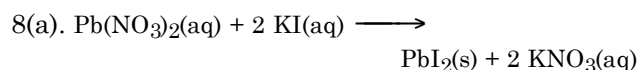
3. AgNO₃, (NH₄)₂Cr₂O₇, Ca(C₂H₃O₂)₂, Ca(NO₃)₂, and KIO₂

4. (a) YES, CaS; (b) YES, PbCO₃; (c) NO; (d) YES, Ni(OH)₂

5(a) C; (b) C; (c) A

6. (a) OR; (b) AB; (c) AB; (d) P and (e) P

7. (b), (c) and (e)



9(a).

Name	Formula
<i>hydrofluoric acid</i>	HF
<i>hypofluorous acid</i>	HFO
<i>fluorous acid</i>	HFO ₂
<i>fluoric acid</i>	HFO ₃
<i>perfluoric acid</i>	HFO ₄

9(b).

Name	Formula
<i>potassium hypochlorite</i>	KClO
<i>potassium chlorite</i>	KClO ₂
<i>potassium chlorate</i>	KClO ₃
<i>potassium perchlorate</i>	KClO ₄

10. (a) +5; (b) +5; (c) -3; (d) +3; (e) 0

11. (a) B; (b) B

11(c) 32 mL KMnO₄

12 (a) 2.33 g BaSO₄; (b) 0.028 mol Na⁺; 0.02 mol NO₃;
0 mol Ba⁺²; 0.004 mol SO₄⁻²