

Exam Three
CHM 203 (Dr. Mattson)
3 OCTOBER 2007

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. If you need more space, you may use the back of your periodic table — Write: "See PT" in box. **BOX YOUR ANSWERS!** Write legibly.

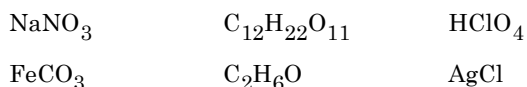
Chapter 4. Reactions in Aqueous Solution

1. (3 pts) Sketch your concept of an aqueous ammonium sulfate solution.

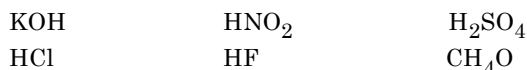


2. (3 pts) What is the concentration of sodium ions in a solution that is 0.212 M sodium phosphate?

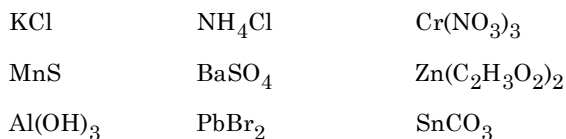
3. (6 pts) Which of these are strong electrolytes? (0 – 6 are possible) Circle your choices.



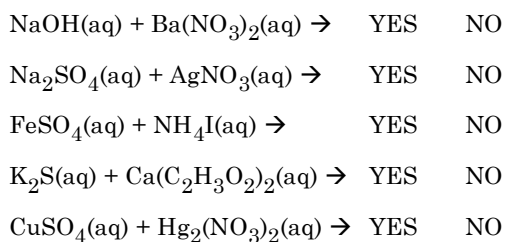
4. (6 pts) Which of these are weak electrolytes? (0 – 6 are possible) Circle your choices.



5. (9 pts) Circle each of the following substances that is soluble in water.



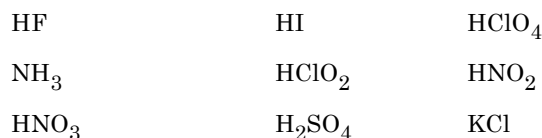
6. (10 pts) Will a precipitate form when these pairs of aqueous solutions are mixed?



7. (4 pts) Write the net ionic reaction that takes place when the following two solutions form a precipitate: nickel(II) acetate and potassium phosphate.

8. (4 pts) Write a balanced ionic reaction (*not net ionic*) for the neutralization reaction between aqueous solutions of perchloric acid and calcium hydroxide.

9. (9 pts) Circle all of the strong acids from those listed here. Draw a box around all of the weak acids. If the substance is not an acid, cross it out by drawing a line through it.



10. (3 pts) Sketch your concept of an aqueous hydrochloric acid solution using the beaker provided.

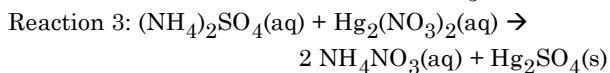
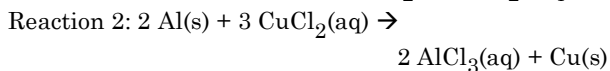
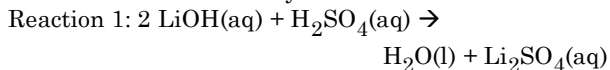


11. (3 pts) Sketch your concept of an aqueous hydrofluoric acid solution using the beaker provided.



12. (6 pts) Classify each of the following reactions.

Each reaction is used only once.



The precipitation reaction is Reaction ____.

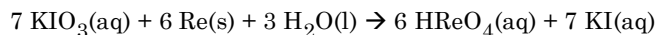
The acid-base reaction is Reaction ____.

The oxidation-reduction reaction is Reaction ____.

13. (10 pts) Assign oxidation numbers to the chlorine atom in each of the following compounds.

LiCl
HCl
HClO ₃
KClO ₄
Cl ₂ O ₇

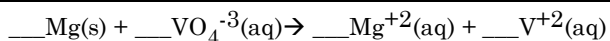
14. (8 pts) (a) Circle the species being oxidized in the following reaction and draw a box around the species being reduced.



(b) Identify the reducing agent

(c) Identify the oxidizing agent

15. (5 pts) Balance the following oxidation-reduction reaction in acidic solution. (You may add other substances as required by the rules for balancing redox reactions.)



16. (3 pts) In lecture, I showed how the conductivity light could be used to test if a solution were a strong, weak or non-electrolyte. What did a bright light, dim light and no light represent?

Matching:

_____ bright light	A. strong electrolyte
_____ dim light	B. non-electrolyte
_____ no light	C. weak electrolyte

17. (8 pts) In the demonstration where I placed a piece of aluminum foil in a colossal test tube containing copper(II) chloride dissolved in water. When the reaction was over, some aluminum foil remained.

(a) What was the color of aqueous Cu^{+2} ?

(b) What happen to the Cu^{+2} ?

It became:

(c) What was the limiting reagent?

(d) Write the balanced net ionic reaction for this experiment.

Sign the Academic Integrity pledge *and* print your name here:

Your exam score (100 possible): _____

Determine your grade:

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

Answers

1. Your sketch should feature two ammonium ions, NH_4^+ for every sulfate ion, SO_4^{2-}
2. 0.636 M Na^+
3. NaNO_3 and HClO_4
4. HNO_2 and HF
5. KCl , NH_4Cl , $\text{Cr}(\text{NO}_3)_3$, and $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2$
6. $\text{NaOH}(\text{aq}) + \text{Ba}(\text{NO}_3)_2(\text{aq}) \rightarrow$ I will accept either answer for this one.
 $\text{Na}_2\text{SO}_4(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow$ NO
 $\text{FeSO}_4(\text{aq}) + \text{NH}_4\text{I}(\text{aq}) \rightarrow$ NO
 $\text{K}_2\text{S}(\text{aq}) + \text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) \rightarrow$ YES NO
 $\text{CuSO}_4(\text{aq}) + \text{Hg}_2(\text{NO}_3)_2(\text{aq}) \rightarrow$ YES NO
7. $3 \text{Ni}^{+2}(\text{aq}) + 2 \text{PO}_4^{-3}(\text{aq}) \rightarrow \text{Ni}_3(\text{PO}_4)_2(\text{s})$
8. $2 \text{H}^+(\text{aq}) + 2 \text{ClO}_4^-(\text{aq}) + \text{Ca}^{+2}(\text{aq}) + 2 \text{OH}^-(\text{aq}) \rightarrow 2 \text{H}_2\text{O}(\text{l}) + \text{Ca}^{+2}(\text{aq}) + \text{ClO}_4^-(\text{aq})$
9. strong acids: HI , HClO_4 , HNO_3 and H_2SO_4
weak acids: HF , HClO_2 , and HNO_2
not an acid: NH_3 and KCl
10. Your sketch should feature dissociated ions, one H^+ for every sulfate ion, Cl^-
11. HF is a weak acid and so does not dissociate into ions very well. Your sketch should feature many associated HF molecules and, perhaps a few ions, one H^+ for every sulfate ion, F^-
12. 3, 1, 2
13. -1, -1, +5, +7 and +7
14. The species being oxidized is Re and the species being reduced is KIO_3 .
The reducing agent is Re
The oxidizing agent is KIO_3 .
15. $16 \text{H}^+(\text{aq}) + 3 \text{Mg}(\text{s}) + 2 \text{VO}_4^{-3}(\text{aq}) \rightarrow 3 \text{Mg}^{+2}(\text{aq}) + 2 \text{V}^{+2}(\text{aq}) + 8 \text{H}_2\text{O}(\text{l})$
16. A, C, B
17. (a) blue
(b) The Cu^{+2} was reduced to elemental copper, $\text{Cu}(\text{s})$
(c) $\text{CuCl}_2(\text{aq})$
(d) $2 \text{Al}(\text{s}) + 3 \text{Cu}^{+2}(\text{aq}) \rightarrow 2 \text{Al}(\text{s}) + 3 \text{Cu}^{+2}(\text{aq})$