

**EXAM THREE**  
**CHM 203 (Dr. Mattson)**  
**8 OCTOBER 2008**

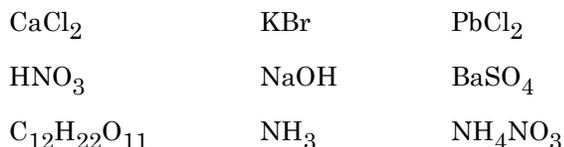
**Academic Integrity Pledge:**

*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.*

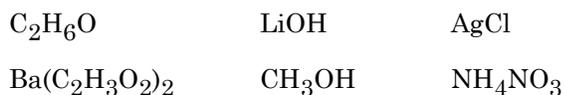
*Signature:*

**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 and then attach the periodic table. **BOX YOUR ANSWERS!** Write legibly.

1. (9 pts) Circle the following substances that are strong electrolytes. Note:  $C_{12}H_{22}O_{11}$  is sugar.



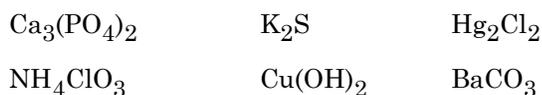
2. (6 pts) Circle the following substances that are non-electrolytes. Note: All of the covalent-molecular compounds listed dissolve in water.



3. (2 pts) Acetic acid in water made the conductivity light glow just a little. Which explanation is best?

- A. Acetic acid is a weak electrolyte.  
 B. Acetic acid does not dissolve in water very well.  
 C. Only soluble ionic compounds conduct electricity.  
 D. Strong acids are strong electrolytes.

4. (6 pts) Circle all of the ionic solids expected to be insoluble in water.



5. In class, I performed a precipitation reaction by mixing solutions of aqueous calcium chloride and aqueous sodium carbonate. (a) (3 pts) Write and balance the reaction that took place, including states of matter (s), (l), (g), (aq).

- 5(b) (2 pts) Write the net ionic reaction.

- 5(c) (2 pts) Sketch the contents of the solution that results.



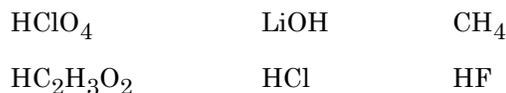
6. (10 pts) Predict if a precipitate is expected when the following aqueous solutions are mixed. If no precipitate is expected, write "No." If a one is expected, write the formula for the precipitate (Not necessary to write the reaction for credit.)

	Write "No" or give formula of ppt
A. $Pb(NO_3)_2 + KI$	
B. $BaCl_2 + NaC_2H_3O_2$	
C. $KCl + Na_2SO_4$	
D. $Li_2S + CaCl_2$	
E. $HCl + KOH$	

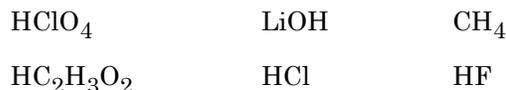
7. (4 pts) How could one prepare calcium fluoride, known to be insoluble, from a precipitation reaction? Your answer will give two solutions and will be of the format:  $NaCl(aq)$ .

+

8. (6 pts) Circle the following substances that are acids.



9. (6 pts) Put a box around the strong acids listed.



10. (6 pts) There are actually more than six strong acids; the others are rare compared to the six you memorized. In each of the following pairs, there is one strong acid. By an extension of your knowledge, which one of each pair would you expect to be a strong acid?

- A.  $\text{HBrO}_3$  or  $\text{HBrO}_4$   
 B.  $\text{H}_2\text{SeO}_4$  or  $\text{H}_2\text{SeO}_3$   
 C.  $\text{HAt}$  or  $\text{HAtO}$

11. In class I reacted  $\text{HCl}$  with  $\text{NaOH}$ . Although I used solid  $\text{NaOH}$ , the same reaction would take place with aqueous solutions. In other words,  $\text{HCl(aq)}$  reacts with  $\text{NaOH(aq)}$ . (a) (3 pts) Write and balance the overall reaction that takes place.

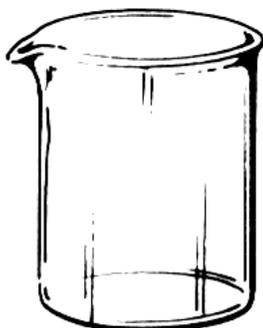
11(b) (3 pts) Write the balanced net ionic equation.

12. In the reaction between barium hydroxide with sulfuric acid, two types of reactions take place. (a) (3 pts) Write and balance the reaction:

12(b) (3 pts) What are the two reactions? Circle two of these:

Precipitation   Acid-base   Oxidation-reduction

12(c) (3 pts) Sketch the contents of the beaker showing what is present after equal mole amounts of barium hydroxide with sulfuric acid have been mixed.

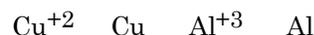


13. We saw aqueous copper(II) chloride react with aluminum foil. The blue color disappeared and large amounts of reddish elemental copper were produced. At the same time, the aluminum foil disappeared and it is known that  $\text{Al}^{+3}\text{(aq)}$  was produced. (a) (3 pts) Write and balance the reaction that took place.

13(b) (2 pts) Was  $\text{Cu}^{+2}$  oxidized or reduced?

13(c) (2 pts) Was Al metal oxidized or reduced?

13(d) (2 pts) After some time, the blue color of the solution was completely gone, leaving a considerable amount of aluminum foil and elemental copper in a colorless solution. What was the limiting reagent?



14. (5 pts) Identify the oxidation number for the phosphorus atom in each of these.

	Oxidation number for P:
A. $\text{Na}_3\text{PO}_4$	
B. $\text{P}_2\text{O}_5$	
C. $\text{PCl}_3$	
D. $\text{Li}_3\text{P}$	
E. $(\text{NH}_4)_3\text{PO}_3$	

15. (4 pts) Balance the following oxidation-reduction reaction:



16. (4 pts) What is the molar concentration of each ion in a solution that is 0.222 M  $\text{Na}_3\text{PO}_4$ ?

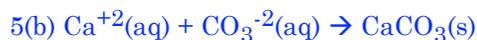
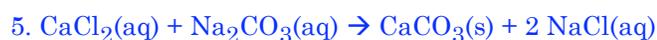
(1 pt) Print your name here and sign Academic Integrity Statement on other side.

**Your exam score (100 possible):** \_\_\_\_\_

Determine your grade:

$A \geq 95$ ;  $A \geq 90$ ;  $B+ \geq 85$ ;  $B \geq 80$ ;  $C+ \geq 75$ ;  $C \geq 70$ ;  $D \geq 60$

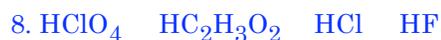
## Answers:

5(c) (2 pts) Sketch should include  $\text{CaCO}_3(\text{s})$  on the bottom and  $\text{Na}^+$  and  $\text{Cl}^-$  ions in the aqueous portion.

6.

	Write "No" or give formula of ppt
A. $\text{Pb}(\text{NO}_3)_2 + \text{KI}$	$\text{PbI}_2$
B. $\text{BaCl}_2 + \text{NaC}_2\text{H}_3\text{O}_2$	No
C. $\text{KCl} + \text{Na}_2\text{SO}_4$	No
D. $\text{Li}_2\text{S} + \text{CaCl}_2$	$\text{CaS}$
E. $\text{HCl} + \text{KOH}$	No

7. Any soluble calcium salt and any soluble fluoride salt would work. For example, calcium chloride, calcium nitrate, calcium acetate, calcium peroxide, and many others possible mixed with a soluble fluoride salt such as lithium fluoride, sodium fluoride, potassium fluoride, ammonium fluoride, to name a few.



12(b) Precipitation Acid-base

12(c) This reaction is unusual because it is an acid-base reaction and a precipitation reaction. As noted with the overall reaction, the products are water and insoluble barium sulfate. The beaker should show a pile of barium sulfate on the bottom and only water.

13. (a) I did not specify overall or net ionic, so both are acceptable:



13(b) reduced

13(c) oxidized

13(d)  $\text{Cu}^{+2}$ 

14.

	Oxidation number for P:
A. $\text{Na}_3\text{PO}_4$	5
B. $\text{P}_2\text{O}_5$	5
C. $\text{PCl}_3$	3
D. $\text{Li}_3\text{P}$	-3
E. $(\text{NH}_4)_3\text{PO}_3$	3

16. 0.666 mol  $\text{Na}^+$  /L and 0.222 mol  $\text{PO}_4^{-3}$ /L or also written as: 0.666 M  $\text{Na}^+$  and 0.222 M  $\text{PO}_4^{-3}$