

## Exam 2 Chm 203 (Dr Mattson) 11 October 2012

**Academic Integrity Pledge:** In keeping with Creighton University's ideals and with the Academic Integrity Code, 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! Write legibly. Include units whenever appropriate. **BOX YOUR ANSWERS!** 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 the answer box and then attach the periodic table. At your desk you are allowed only pencils (but no pencil pouch), an eraser, and a non-programmable calculator without a slipcover. Backpacks and purses must be stored in the front of the room. Cell phones must be OFF and placed at the front of the room.

1. (5 pts) Which of these ions are always soluble? Circle all that apply.

- A. acetates    B. sulfides    C. hydroxides  
D. bromides    E. perchlorates

2. (5 pts) Which of these ions forms salts that are *generally* insoluble? Circle all that apply.

- A. nitrates    B. sulfates    C. carbonates  
D. ammonium    E. chlorides

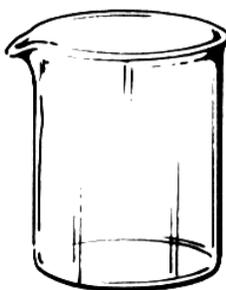
3. (6 pts) Classify the following reactions as acid-base (AB), precipitation (P), oxidation-reduction (OR) or no reaction (NR).

$\text{AgNO}_3(\text{aq}) + \text{NH}_4\text{Cl}(\text{aq}) \rightarrow$	AB P OR NR
$\text{HNO}_3(\text{aq}) + \text{KOH}(\text{aq}) \rightarrow$	AB P OR NR
$\text{Ba}(\text{NO}_3)_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow$	AB P OR NR
$\text{HC}_2\text{H}_3\text{O}_2(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow$	AB P OR NR
$\text{CuSO}_4(\text{aq}) + \text{Mg}(\text{s}) \rightarrow$ $\text{Cu}(\text{s}) + \text{MgSO}_4(\text{aq})$	AB P OR NR
$\text{FeSO}_4(\text{aq}) + \text{NaNO}_3(\text{aq}) \rightarrow$	AB P OR NR
$\text{CuCl}(\text{aq}) + \text{CoCl}_3(\text{aq}) \rightarrow$ $\text{CuCl}_2(\text{aq}) + \text{CoCl}_2(\text{aq})$	AB P OR NR

4. We saw, as a demonstration, the reaction between aqueous copper(II) chloride and aluminum foil.

4a. (2 pts) Sketch the aqueous copper(II) chloride solution in the beaker at right.

4b. (2 pts) Write and balance the overall reaction in the box below.



4c. (2 pts) Write the balanced net ionic reaction.

5. (5 pts) Which of these solutions form strong electrolytes when dissolved in water? Circle all that apply.

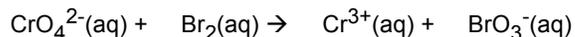
- A.  $\text{KC}_2\text{H}_3\text{O}_2$     B.  $\text{HC}_2\text{H}_3\text{O}_2$     C.  $\text{C}_2\text{H}_5\text{OH}$   
D.  $\text{HClO}_2$     E.  $\text{H}_2\text{SO}_4$

6. (2 pts) Write the net ionic reaction that takes place between nitric acid and potassium hydroxide.

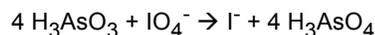
7. (4 pts) Assign oxidation numbers to the vanadium in each of these compounds.

A. $\text{V}_2\text{O}_5$	B. $\text{VCl}_3$
C. $\text{K}_4\text{VCl}_6$	D. $(\text{NH}_4)_2\text{VO}_3$

8. (3 pts) Balance the reaction below under acidic conditions.



9. (3 pts) Consider the balanced reaction below which takes place in aqueous solution. What volume of 0.5367 M  $\text{H}_3\text{AsO}_3$  is required for complete reaction with 20.00 mL of 0.2119 M  $\text{KIO}_4$  solution?





## Answers:

1. A, E
2. C
3. P, AB, P, AB, OR, NR, OR
4. We saw, as a demonstration, the reaction between aqueous copper(II) chloride and aluminum foil.  
4a. Picture should show one  $\text{Cu}^{+2}$  ion for every two  $\text{Cl}^-$  ions.  
4b.  $3 \text{CuCl}_2(\text{aq}) + 2 \text{Al}(\text{s}) \rightarrow 3 \text{Cu}(\text{s}) + 2 \text{AlCl}_3(\text{aq})$   
4c.  $3 \text{Cu}^{+2}(\text{aq}) + 2 \text{Al}(\text{s}) \rightarrow 3 \text{Cu}(\text{s}) + 2 \text{Al}^{+3}(\text{aq})$
5. A, E
6.  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$  or  
 $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow 2 \text{H}_2\text{O}(\text{l})$
7. +5, +3, +2, +4
8. All aqueous:  $10 \text{CrO}_4^{2-} + 3 \text{Br}_2 + 44 \text{H}^+ \rightarrow 10 \text{Cr}^{3+} + 6 \text{BrO}_3^- + 22 \text{H}_2\text{O}$
9. 31.59 mL  $\text{H}_3\text{AsO}_3$

10.

Formula:	Name:
$\text{Ag}_2\text{SO}_4$	silver(I) sulfate
HF	hydrogen fluoride
$\text{HClO}_4$	perchloric acid
$\text{Cl}_2\text{O}_5$	dichlorine pentoxide
$\text{HNO}_3$	nitric acid
$\text{NaClO}_2$	sodium chlorite
$\text{H}_2\text{SO}_4$	sulfuric acid
$\text{HClO}_2$	chlorous acid
$\text{V}_3\text{P}_4$	vanadium(IV) phosphide
$\text{NH}_3$	ammonia

11. A.  $\lambda = 130 \text{ nm}$   
B.  $\nu = 6.3 \times 10^{13} \text{ s}^{-1}$   
C.  $E = 1.7 \times 10^{-18} \text{ J}$   
D.  $\lambda = 1 \times 10^{-9} \text{ m}$
- 12a. B
- 12b. 410 nm
- 12c. 486 nm
- 12d. 276 kJ/mol.
- 12e. A
13. A. 4s  
B.  $n = 2, l = 1$   
C. Same  
D. 4f

14. 5, 2, 3, 4, 2

15.  $[\text{Ar}] 4s^2 3d^{10} 4p^4$

16.

	filled before		fills after
A.	3s	3p	4s
B.	5s	4d	5p
C.	4p	5s	4d
D.	6s	4f	5d

17. Zr and Pd

18. 18

19. 7

20. 119