

# Chem 103: Dr. Loh

## Problem Set 5: Electrolytes and Reactions

Name \_\_\_\_\_ Due Date: 10/16/09

Extra Practice Problems (answers in textbook): Chapter 4: 7, 16, 63, 65, 67, 69, 71, 77, 79, 81, 83, 87, 93, 107, 111

**Note:** You must show all of your work clearly to get full credit.

1. Define the terms **dissociate** and **dissolve**.
  
  
  
  
  
  
  
  
  
  
2. A strong electrolyte \_\_\_\_\_ completely in solution. *Circle all correct answers.*
  - (a) reacts
  - (b) dissolves
  - (c) dissociates
  - (d) decomposes
  - (e) precipitates
  
3. Which of the following forms an insoluble salt with barium ion? *Circle all correct answers*
  - (a) chloride
  - (b) acetate
  - (c) sulfur trioxide
  - (d) carbonate
  - (e) hydroxide
  
4. The substance dinitrogen tetroxide is a \_\_\_\_\_. *Circle all correct answers*
  - (a) strong base
  - (b) ion
  - (c) weak acid
  - (d) soluble salt
  - (e) none of the above
  
5. A weak electrolyte exists mostly as \_\_\_\_\_ in solution. *Circle all correct answers.*
  - (a) atoms
  - (b) ions
  - (c) molecules
  - (d) electrons
  - (e) isotopes

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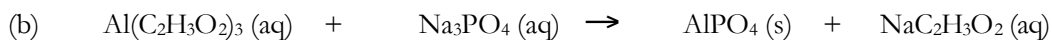
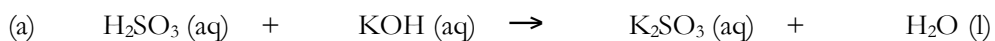
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6. Complete the following table by choosing one term in each category (in column 3, the terms are strong electrolyte=SE, weak electrolyte=WE, non-electrolyte=NE, or not an electrolyte=NA).

Substance	Atom or Molecule or Ionic Compound	Soluble or Insoluble	Type of Electrolyte (SE, WE, NE or NA)
(a) iron			
(b) HF			
(c) Al(OH) <sub>3</sub>			
(d) NO <sub>2</sub>			
(e) magnesium sulfate			
(f) Ba(OH) <sub>2</sub>			
(g) NH <sub>3</sub>			

7. For each of the following reactions: (1) **Balance** the reaction equation; (2) write the **ionic** and **net ionic equations** and (3) indicate which ions are the **spectator ions**.

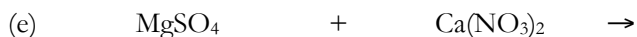
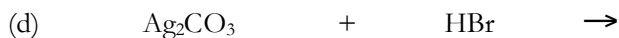


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8. Complete and balance the following equations (watch out for gas formation!), indicating the **physical states of all compounds**. Be sure to check the net ionic equation for each reaction. If there is no net chemical change, write NR (no reaction). Please box your final balanced reaction equation.



9. You wish to make  $\text{BaSO}_4$ , and have only *one* insoluble species in the entire reaction. This can be achieved by combining which of the following? *Circle all correct answers.*

- (a)  $\text{BaCO}_3$  and  $\text{Na}_2\text{SO}_4$
- (b) Sulfurous acid and barium nitrate
- (c)  $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$  and  $\text{H}_2\text{SO}_4$
- (d)  $\text{BaCl}_2$  and  $\text{Ag}_2\text{SO}_4$
- (e) Calcium sulfide and barium chloride

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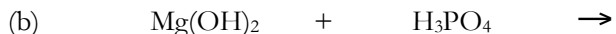
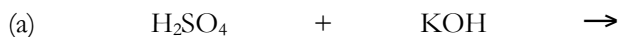
10. The balanced net ionic equation for the reaction between  $\text{Al}(\text{OH})_3$  and  $\text{HNO}_3$  is:

- (a)  $\text{Al}(\text{OH})_3(\text{s}) + 3 \text{H}^+ + 3 \text{NO}_3^- \rightarrow 3 \text{H}^+ + 3 \text{OH}^- + \text{Al}^{3+} + 3 \text{NO}_3^-$
- (b)  $\text{Al}(\text{OH})_3(\text{s}) \rightarrow 3 \text{OH}^- + \text{Al}^{3+}$
- (c)  $3 \text{OH}^- + 3 \text{H}^+ \rightarrow 3 \text{H}_2\text{O}$
- (d)  $\text{Al}(\text{OH})_3(\text{s}) + 3 \text{H}^+ \rightarrow 3 \text{H}_2\text{O} + \text{Al}^{3+}$
- (e)  $\text{Al}(\text{OH})_3(\text{s}) + 3 \text{HNO}_3 \rightarrow 3 \text{H}_2\text{O} + \text{Al}^{3+} + \text{NO}_3^-$

11. The spectator ions in the reaction between aqueous HF and aqueous  $\text{Ba}(\text{OH})_2$  are:

- (a)  $\text{OH}^-$ ,  $\text{F}^-$ , and  $\text{Ba}^{2+}$
- (b)  $\text{F}^-$  and  $\text{Ba}^{2+}$
- (c)  $\text{OH}^-$  and  $\text{F}^-$
- (d)  $\text{Ba}^{2+}$  only
- (e) There are no spectator ions.

12. Complete and balance the following reactions and *include the physical states of all species*.



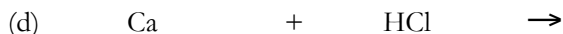
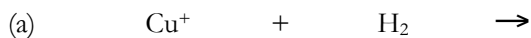
13. A 20.0 mL sample of  $\text{H}_3\text{PO}_4$  of unknown concentration is titrated with 0.100 M NaOH. The equivalence point is reached when 18.45 mL of NaOH solution has been added. Determine the concentration of the original  $\text{H}_3\text{PO}_4$  solution. *Hint: Start by writing the balanced reaction equation.*

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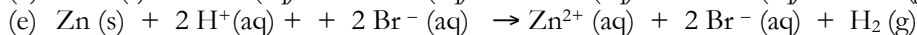
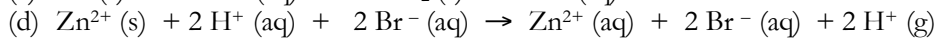
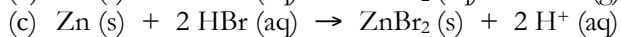
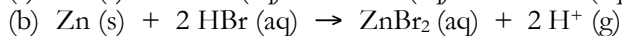
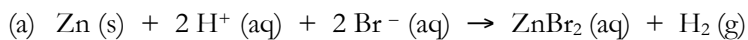
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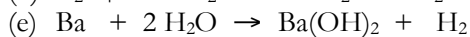
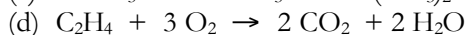
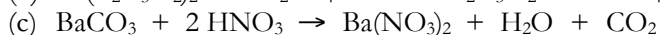
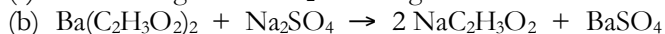
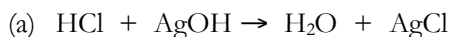
14. Use the activity series to predict the outcome of the following reactions (be sure to **balance** the final equation). If no reaction occurs, write NR.



15. The ionic equation for the dissolution of zinc metal in aqueous hydrobromic acid is:



16. Which of the following is an oxidation-reduction reaction? *Circle all correct answers.*

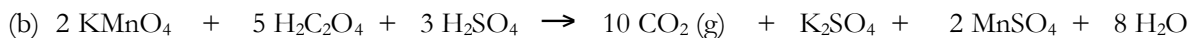
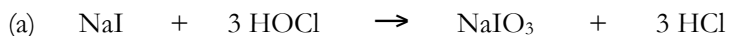


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17. Assign oxidation numbers to each atom in the substances below, then use the oxidation numbers to identify the **oxidizing agent**, the **reducing agent**, the **element that is oxidized**, and the **element that is reduced** for each reaction.



18. Choose reactants that will yield the following **net ionic equation**. Write the corresponding balanced molecular equation, including all physical states.

