

# Workbook



## Table of Contents

Reactions in Aqueous Solutions .....	2
Introduction to Aqueous Solutions.....	2
Precipitation Reactions .....	3
Oxidation-Reduction Reactions.....	4

# Reactions in Aqueous Solutions

## Introduction to Aqueous Solutions

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### Questions

- Determine the concentration of the following ions:
  - $[K^+]$  in 0.328 M KCl
  - $[SO_4^{2-}]$  in 0.267 M  $Al_2(SO_4)_3$
  - $[Al^{3+}]$  in 0.267 M  $Al_2(SO_4)_3$
  - $[Na^+]$  in 0.198 M  $Na_2SO_4$
- A solution is 0.17 M  $Na_2SO_4$  and 0.23 M  $CuSO_4$ .  
What are the concentrations of the ions in the solution?
- What are the molarities of the following ions?
  - 455 mg  $Na^+$ /1 L
  - 22.8 mg  $I^-$ /100 mL
- What molarity of  $MgI_2(aq)$  corresponds to an iodine content of 16 mg  $I^-$ /1 L solution?

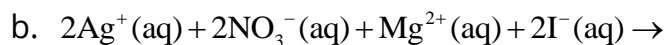
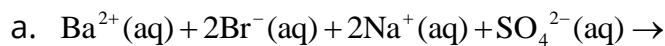
### Answer Key

- a. 0.328 M      b. 0.801 M      c. 0.534 M      d. 0.396 M
- 0.34 M  $Na^+$ , 0.23 M  $Cu^{2+}$ , 0.40 M  $SO_4^{2-}$
- a. 0.02 M      b.  $1.8 \cdot 10^{-3}$  M
- $6.3 \cdot 10^{-5}$  M

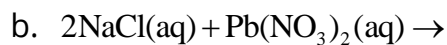
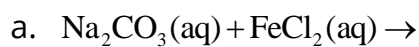
### Precipitation Reactions

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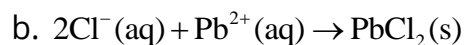
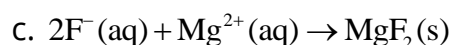
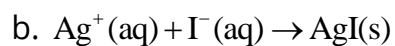
1) Complete each of the following as a net ionic equation:



2) Complete each of the following as a net ionic equation:



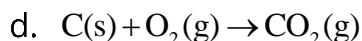
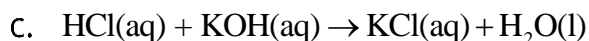
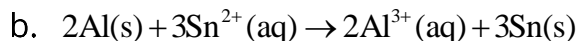
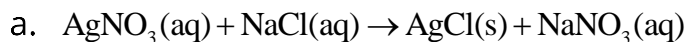
### Answer Key



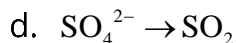
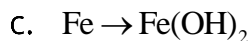
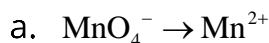
### Oxidation-Reduction Reactions

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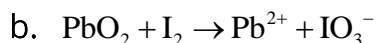
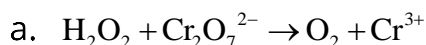
1) Indicate which of the following reactions are redox reactions and which are not:



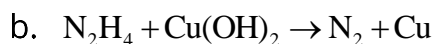
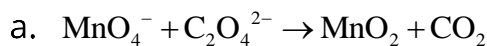
2) Complete and balance the following half equations:



3) Balance the following equations for redox reactions occurring in acidic solution:



4) Balance the following equations for redox reactions occurring in basic solution:



### Answer Key

1) a. Not redox reaction

b. Redox reaction

c. Not redox reaction

d. Redox reaction

2) a.  $5e^- + \text{MnO}_4^- + 8\text{H}^+ \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$

b.  $2\text{NH}_2\text{OH} + 2\text{OH}^- \rightarrow \text{N}_2 + 2e^- + 4\text{H}_2\text{O}$

c.  $\text{Fe} + 2\text{OH}^- \rightarrow \text{Fe}(\text{OH})_2 + 2e^-$

d.  $\text{SO}_4^{2-} + 2e^- + 4\text{H}^+ \rightarrow \text{SO}_2 + 2\text{H}_2\text{O}$

3) a.  $8\text{H}^+ + 3\text{H}_2\text{O}_2 + \text{Cr}_2\text{O}_7^{2-} \rightarrow 3\text{O}_2 + 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$

b.  $8\text{H}^+ + 5\text{PbO}_2 + \text{I}_2 \rightarrow 5\text{Pb}^{2+} + 2\text{IO}_3^- + 4\text{H}_2\text{O}$

4) a.  $4\text{H}_2\text{O} + 2\text{MnO}_4^- + 3\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{MnO}_2 + 6\text{CO}_2 + 8\text{OH}^-$

b.  $\text{N}_2\text{H}_4 + 2\text{Cu}(\text{OH})_2 \rightarrow \text{N}_2 + 2\text{Cu} + 4\text{H}_2\text{O}$