Chapter 6 Practice

6.1 Chemical Equations

1. Balance each of the following:

$K + Cl_2 \rightarrow KCl$	$Li\ (s) + O_2\ (g) \rightarrow Li_2O\ (g)$
$Al + S \rightarrow Al_2S_3$	$C_2H_2 + Br_2 \rightarrow C_2H_2Br_4$
$Sr + O_2 \rightarrow SrO$	$Ca + H_2O \rightarrow Ca(OH)_2 + H_2$
$Al + HCl \rightarrow AlCl_3 + H_2$	$Zn\ (s) + HCl\ (aq) \rightarrow ZnCl_2\ (aq) + H_2\ (g)$
$U + F_2 \rightarrow UF_6$	$Ca(OH)_2\ (aq) + HCl\ (aq) \rightarrow CaCl_2\ (aq) + H_2O\ (l)$
$P + Cl_2 \rightarrow PCl_3$	$NaOH + H_2SO_4 \rightarrow H_2O + Na_2SO_4$

6.2 Classifying Reactions

2. Label each reaction above as a synthesis (S), decomposition (D), single displacement (SD), or double displacement (DD) reaction.

6.3 Reactions between Metals and Nonmetals

3. In the following reactions, identify the element that is oxidized and the element that is reduced:

$2\ Ca + O_2 \rightarrow 2\ CaO$

$Zn + S \rightarrow ZnS$

$Br_2 + Cu \rightarrow CuBr_2$

4. Write and balance equations for each of the following:

The reaction of elemental copper with chlorine gas to form copper(II) chloride

The reaction of elemental zinc with bromine gas

The reaction of elemental lithium with oxygen gas

5. Write and balance equations for each of the following, including phase symbols:

The reaction of elemental magnesium with oxygen gas to form solid magnesium oxide

The reaction of calcium metal with chlorine gas to form solid calcium chloride

The reaction of iron metal with oxygen gas to form solid iron(III) oxide

6.4 Combustion

6. Write balanced equations for the combustion of each of the following:

magnesium carbon C_4H_8 C_5H_{10}

6.5 Reactions in Aqueous Solution

Write molecular and ionic equations for each of the following:

Sodium chloride dissolves in water.

Aluminum chloride dissolves in water.

8. Identify each compound as soluble or insoluble in water.

$FeCl_3$	Na_2SO_4	$(NH_4)_2CO_3$	$BaSO_3$
$ZnCO_3$	$ZnCl_2$	$PbCl_2$	KBr

9. An aqueous mixture containing lead(II) and chloride ions is combined with another aqueous mixture containing ammonium and sulfate ions. Write the formula for the insoluble product that will be produced.

10. The equations below represent precipitation reactions. Rewrite these as complete ionic and net ionic equations.

Molecular Equation	$AgNO_3$ (*aq*) + KCl (*aq*) → KNO_3 (*aq*) + AgCl (*s*)
Complete Ionic Equation	
Net Ionic Equation	

Molecular Equation	$Ba(ClO_4)_2$ (*aq*) + K_2SO_4 (*aq*) → $BaSO_4$ (*s*) + 2 $KClO_4$ (*aq*)
Complete Ionic Equation	
Net Ionic Equation	

11. The equation below represents a neutralization reaction. Rewrite this as complete ionic equations and net ionic equations.

Molecular Equation	2 HCl (*aq*) + $Ba(OH)_2$ (*aq*) → 2 H_2O (*l*) + $BaCl_2$ (*aq*)
Complete Ionic Equation	
Net Ionic Equation	

12. Write balanced molecular equations for the following reactions. Include phase symbols.

Aqueous lead(II) perchlorate reacts with aqueous sodium chloride.

Aqueous ammonium carbonate reacts with aqueous zinc bromide.

Aqueous hydrochloric acid reacts with aqueous sodium hydroxide.

Aqueous sulfuric acid reacts with aqueous cesium hydroxide.

13. Each of the following reactions results in one water-soluble product and one precipitate. Complete and balance each reaction and show phases to indicate whether the products are aqueous or solid.

$KCl\ (aq) + Pb(NO_3)_2\ (aq) \rightarrow$

$KOH\ (aq) + FeCl_3\ (aq) \rightarrow$

$BaCl_2\ (aq) + K_3PO_4\ (aq) \rightarrow$

14. The reactions below draw from all of the reaction types introduced in this chapter. Predict the products and balance each equation.

$AgC_2H_3O_2\ (aq) + NaCl\ (aq) \rightarrow$

$Na\ (s) + Cl_2\ (g) \rightarrow$

$HCl\ (aq) + Ba(OH)_2\ (aq) \rightarrow$

$C_{10}H_{20}\ (l) + O_2\ (g) \rightarrow$

Solubility Rules

Compounds containing these ions are always soluble	
Alkali metals:	Li^+, Na^+, K^+, Rb^+
Ammonium:	NH_4^+
Large −1 oxyanions	NO_3^-, ClO_3^-, ClO_4^-, $C_2H_3O_2^-$
Compounds containing these ions are usually soluble	
Halides: (except Pb^{2+}, Ag^+)	F^-, Cl^-, Br^-, I^-
Sulfate (except Ba^{2+}, Ca^{2+}, Pb^{2+}, Ag^+)	SO_4^{2-}
Not Soluble	
Most other ions	