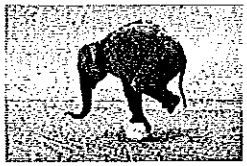
9/4/2012



S10 Unit A: Chemistry - Balancing and Writing Reactions Practice

Name: Key

Date: Oct 1st 2012

1. Balance the following chemical equations.

2 $H_{2(g)}$ + 1 $O_{2(g)}$ → 2 $H_2O_{(l)}$

2 $Cu_{(s)}$ + 1 $S_{(s)}$ → 1 $Cu_2S_{(s)}$

2 $KCl_{(s)}$ → 2 $K_{(s)}$ + 1 $Cl_{2(g)}$

1 $N_{2(g)}$ + 3 $H_{2(g)}$ → 2 $NH_{3(g)}$

1 $Fe_2O_{3(s)}$ + 3 $H_{2(g)}$ → 2 $Fe_{(s)}$ + 3 $H_2O_{(l)}$

2 $NaOH_{(aq)}$ + 1 $CO_{2(g)}$ → 1 $Na_2CO_{3(aq)}$ + 1 $H_2O_{(l)}$ (HOH)

1 $FeCl_{3(aq)}$ + 3 $NaOH_{(aq)}$ → 1 $Fe(OH)_{3(s)}$ + 3 $NaCl_{(aq)}$

2 $Al(OH)_{3(s)}$ + 3 $H_2SO_{4(aq)}$ → 1 $Al_2(SO_4)_{3(aq)}$ + 6 $H_2O_{(l)}$ (HOH)

1 $NaCl_{(s)}$ + 1 $H_2SO_{4(aq)}$ → 1 $NaHSO_{4(aq)}$ + 1 $HCl_{(g)}$

1 $Ca(OH)_{2(s)}$ + 2 $HCl_{(aq)}$ → 1 $CaCl_{2(aq)}$ + 2 $H_2O_{(l)}$ (HOH)

2 $NO_{(g)}$ + 1 $O_{2(g)}$ → 2 $NO_{2(g)}$

1 $CuSO_{4(aq)}$ + 2 $NaOH_{(aq)}$ → 1 $Cu(OH)_{2(aq)}$ + 1 $Na_2SO_{4(aq)}$

2 $AgNO_{3(aq)}$ + 1 $Cu_{(s)}$ → 1 $Cu(NO_3)_{2(aq)}$ + 2 $Ag_{(s)}$

1 $Pb(C_2H_3O_2)_{2(aq)}$ + 1 $H_2S_{(g)}$ → 1 $PbS_{(s)}$ + 2 $HC_2H_3O_{2(aq)}$

3 $H_2SO_{4(aq)}$ + 1 $Ca_3(PO_4)_{2(s)}$ → 2 $H_3PO_{4(aq)}$ + 3 $CaSO_{4(s)}$

1 $Pb(NO_3)_{2(aq)}$ + 1 $H_2SO_{4(aq)}$ → 1 $PbSO_{4(s)}$ + 2 $HNO_{3(aq)}$

1 $ZnCl_{2(aq)}$ + 1 $(NH_4)_2S_{(aq)}$ → 1 $ZnS_{(s)}$ + 2 $NH_4Cl_{(aq)}$

1 $Ca(OH)_{2(aq)}$ + 1 $Mg(HCO_3)_{2(aq)}$ → 1 $Mg(OH)_{2(s)}$ + 2 $Ca(HCO_3)_{2(aq)}$

1 $Ba(OH)_{2(aq)}$ + 1 $H_2SO_{3(aq)}$ → 2 $H_2O_{(l)}$ + 1 $BaSO_{3(s)}$

2. Classify each of the following reactions by writing F *(formation)*, D *(decomposition)*, SR *(single replacement)*, DR *(double replacement)*, or HC *(hydrocarbon combustion)* to the left of the equation. Balance the equations using the simplest whole numbers possible.

F a. $2\ Cu_{(s)} + 1\ O_{2(g)} \rightarrow 2\ CuO_{(s)}$

D b. $2\ H_2O_{(l)} \rightarrow 2\ H_{2(g)} + 1\ O_{2(g)}$

SR c. $3\ Fe_{(s)} + 4\ H_2O_{(g)} \rightarrow 4\ H_{2(g)} + 1\ Fe_3O_{4(s)}$

DR d. $2\ AsCl_{3(aq)} + 3\ H_2S_{(aq)} \rightarrow 1\ As_2S_{3(s)} + 6\ HCl_{(aq)}$

SR e. $1\ Fe_2O_{3(s)} + 3\ H_{2(g)} \rightarrow 2\ Fe_{(s)} + 3\ H_2O_{(l)}$

D f. $1\ CaCO_{3(s)} \rightarrow 1\ CaO_{(s)} + 1\ CO_{2(g)}$

F g. $8\ Fe_{(s)} + 1\ S_{8(s)} \rightarrow 8\ FeS_{(s)}$

DR h. $1\ H_2S_{(aq)} + 2\ KOH_{(aq)} \rightarrow 2\ HOH_{(l)} + 1\ K_2S_{(aq)}$

D i. $2\ NaCl_{(l)} \rightarrow 2\ Na_{(l)} + 1\ Cl_{2(g)}$

SR k. $2\ Al_{(s)} + 3\ H_2SO_{4(aq)} \rightarrow 3\ H_{2(g)} + 1\ Al_2(SO_4)_{3(aq)}$

DR l. $1\ H_3PO_{4(aq)} + 3\ NH_4OH_{(aq)} \rightarrow 3\ HOH_{(l)} + 1\ (NH_4)_3PO_{4(aq)}$

HC m. $1\ C_3H_{8(g)} + 5\ O_{2(g)} \rightarrow 3\ CO_{2(g)} + 4\ H_2O_{(g)}$

F n. $4\ Al_{(s)} + 3\ O_{2(g)} \rightarrow 2\ Al_2O_{3(s)}$

HC o. $1\ CH_{4(g)} + 2\ O_{2(g)} \rightarrow 1\ CO_{2(g)} + 2\ H_2O_{(g)}$

The 5 Types of Reactions

Formation Reactions:

element + element → compound

e.g. $2\ Mg_{(s)} + O_{2(g)} \rightarrow 2\ MnO_{(s)}$

Decomposition Reactions:

compound → element + elemtent

e.g. $8\ HgS_{(s)} \rightarrow 8\ Hg_{(l)} + S_{8(s)}$

Notes: 1. Formation and decomposition reactions generally involve only pure substances.

2. Remember when predicting products to write the correct chemical formulas first and then balance the equation.

F 1. The first step in the production of sulfuric acid is to burn sulfur

$1\ S_{8(s)} + 8\ O_{2(g)} \rightarrow 8\ SO_{2(g)}$

D 2. In 1774 Joseph Priestly discovered oxygen by decomposing the calx of mercury.

$2\ HgO_{(s)} \rightarrow 2\ Hg_{(l)} + 1\ O_{2(g)}$

D 3. Molten table salt is industrially decomposed to produce molten sodium.

$2\ NaCl_{(l)} \rightarrow 2\ Na_{(l)} + 1\ Cl_{2(g)}$

F 4. Nitrogen from the air reacts with hydrogen to produce ammonia for fertilizers.

$1\ N_{2(g)} + 3\ H_{2(g)} \rightarrow 2\ NH_{3(g)}$

F 5. Rocket fuel burns to propel a satellite into space.

$2\ H_{2(g)} + 1\ O_{2(g)} \rightarrow 2\ H_2O_{(g)}$

D 6. Copper (II) oxide decomposes to form solid copper and oxygen.

$2\ CuO_{(s)} \rightarrow 2\ Cu_{(s)} + 1\ O_{2(g)}$

F 7. Barbeque charcoal undergoes incomplete combustion to produce carbon monoxide.

$2\ C_{(s)} + 1\ O_{2(g)} \rightarrow 2\ CO_{(g)}$

F 8. Freshly cut lithium reacts with nitrogen from the air.

$6\ Li_{(s)} + 1\ N_{2(g)} \rightarrow 2\ Li_3N_{(s)}$

F 9. A silver spoon or coin tarnishes when exposed to sulfur.

$16\ Ag_{(s)} + 1\ S_{8(s)} \rightarrow 8\ Ag_2S_{(s)}$

D 10. Molten lye is decomposed industrially into its elements.

$2\ NaOH_{(l)} \rightarrow 2\ Na_{(s)} + 1\ O_{2(s)} + 1\ H_{2(g)}$

Single and Double Replacement Reactions

1. Classify each of the following reactions by writing F, D, SR, DR, or HC to the left of the equation. Balance the equations using the simplest whole numbers possible.
2. Complex ions are assumed to remain intact and are balanced as complete units.
3. It is convenient for balancing to write water as HOH for single and double replacement reaction.
4. Remember to read the balanced equations in terms of moles.

Single replacement Reactions

Element + compound	element + compound
$Cl_{2(aq)} + 2\,NaI_{(aq)}$	$I_{2(aq)} + NaCl_{(aq)}$

Double Replacement Reactions

Compound + compound	compound + compound
$Pb(NO_3)_{2(aq)} + 2\,KI_{(aq)}$	$PbI_{2(s)} + 2\,KNO_{3(aq)}$

Note: Use the solubility table on page of your text to predict the solubility of the products of single and double replacement reactions in water.

SR 1. Sodium metal reacts vigorously with water.
$2\,Na_{(s)} + 2\,HOH_{(l)} \rightarrow 1\,H_{2(g)} + 2\,NaOH_{(aq)}$

DR 2. Hydrogen chloride gas is produced in the laboratory from table salt.
$2\,NaCl_{(s)} + 1\,H_2SO_{4(aq)} \rightarrow 2\,HCl_{(g)} + 1\,Na_2SO_{4(aq)}$

SR 3. Molten iron is produced in the highly exothermic thermite reaction.
$2\,Al_{(s)} + 1\,Fe_2O_{3(s)} \rightarrow 2\,Fe_{(l)} + 1\,Al_2O_{3(s)}$

DR 4. Slaked lime precipitates magnesium ion from hard water.
$1\,Ca(OH)_{2(aq)} + 1\,Mg(HCO_3)_{2(aq)} \rightarrow 1\,Mg(OH)_{2(s)} + 1\,Ca(HCO_3)_{2(aq)}$

SR 5. Aluminum was first produced in 1825 by Hans Oersted using the following reaction.
$3\,K_{(s)} + 1\,AlCl_{3(s)} \rightarrow 1\,Al_{(s)} + 3\,KCl_{(s)}$

SR 6. Silver is recovered from silver ore by converting the ore into silver sulfate which is then reacted with copper(II).
$1\,Cu_{(s)} + 1\,Ag_2SO_{4(aq)} \rightarrow 1\,CuSO_{4(aq)} + 2\,Ag_{(s)}$

DR 7. Phosphoric acid is produced at a fertilizer plant.
$3\,H_2SO_{4(aq)} + 1\,Ca_3(PO_4)_{2(s)} \rightarrow 2\,H_3PO_{4(aq)} + 3\,CaSO_{4(s)}$

SR 8. Bromine is commercially produced from $MgBr_2$
$1\,Cl_{2(g)} + 1\,MgBr_{2(aq)} \rightarrow 1\,MgCl_{2(aq)} + 1\,Br_{2(g)}$

DR 9. Hydrogen sulfide (sour) gas from a wild natural gas well reacts with the lead(II) chromate pigment in paint on homes.
$1\,H_2S_{(g)} + 1\,PbCrO_{4(s)} \rightarrow 1\,H_2CrO_{4(aq)} + 1\,PbS_{(s)}$

SR 10. Hydrogen sulfide gas from a wild sour natural gas well reacts with the silver in cutlery and ornaments at home.
$1\,H_2S_{(g)} + 2\,Ag_{(s)} \rightarrow 1\,H_{2(g)} + 1\,Ag_2S_{(s)}$

Hydrocarbon Combustion Reactions

A hydrocarbon + oxygen → carbon dioxide + water vapour

$2\ C_2H_{6(g)} + 7\ O_{2(g)} \rightarrow 4\ CO_{2(g)} + 6\ H_2O_{(g)}$

Notes:

1. Write water as $H_2O_{(g)}$ in equations for hydrocarbon combustion reactions. Written as H_2O, balancing is easier. Because of the heat produced in hydrocarbon combustion reactions water is produced as a gas ($H_2O_{(g)}$).
2. Balance C and H atoms first, O atoms last.

HC 1. A bunsen burner, gas furnace and gas hot-water tank all burn natural gas.

$1\ CH_{4(g)} + 2\ O_{2(g)} \rightarrow 1\ CO_{2(g)} + 2\ H_2O_{(g)}$

HC 2. Propane is used as a fuel for trailers and where natural gas is not available.

$1\ C_3H_{8(g)} + 5\ O_{2(g)} \rightarrow 3\ CO_{2(g)} + 4\ H_2O_{(g)}$

HC 3. Gasoline is mixed with air in the carburetor and then exploding by a spark in the cylinder of a car motor.

$2\ C_8H_{18(l)} + 25\ O_{2(g)} \rightarrow 16\ CO_{2(g)} + 18\ H_2O_{(g)}$

HC 4. Kerosene (assume $C_{14}H_{30}$) is a mixture of hydrocarbons used as a fuel for stoves and lanterns and for diesel and jet engines.

$2\ C_{14}H_{30(l)} + 43\ O_{2(g)} \rightarrow 28\ CO_{2(g)} + 30\ H_2O_{(g)}$

HC 5. Oxyacetylene torches are used to produce high temperatures for cutting and welding metals such as steel. This involves burning acetylene.

$2\ C_2H_{2(g)} + 5\ O_{2(g)} \rightarrow 4\ CO_{2(g)} + 2\ H_2O_{(g)}$

HC 6. Butane is burned by lighters.

$2\ C_4H_{10} + 13\ O_{2(g)} \rightarrow 8\ CO_{2(g)} + 10\ H_2O_{(g)}$

Writing and Balancing Equations Review

1. For each of the following equations, identify the type of reaction and add coefficients to balance the equation

	Type	
a.	F	$1\ N_{2(g)} + 3\ H_{2(g)} \rightarrow 2\ NH_{3(g)}$
b.	F	$2\ Na_{(s)} + 1\ Cl_{2(g)} \rightarrow 2\ NaCl_{(s)}$
c.	D	$2\ H_2O_{(l)} \rightarrow 2\ H_{2(g)} + 1\ O_{2(g)}$
d.	SR	$2\ Na_{(s)} + 2\ \overset{HOH}{H_2O_{(l)}} \rightarrow 2\ NaOH_{(aq)} + 1\ H_{2(g)}$
e.	SR	$1\ Zn_{(s)} + 2\ HCl_{(aq)} \rightarrow 1\ ZnCl_{2(aq)} + 1\ H_{2(g)}$
f.	HC	$1\ CH_{4(g)} + 2\ O_{2(g)} \rightarrow 1\ CO_{2(g)} + 2\ H_2O_{(g)}$
g.	F	$1\ P_{4(s)} + 10\ Cl_{2(g)} \rightarrow 4\ PCl_{5(s)}$
h.	SR	$1\ CoCl_{2(aq)} + 2\ Zn_{(s)} \rightarrow 2\ ZnCl_{(aq)} + 1\ Co_{(s)}$
i.	DR	$2\ Na_3PO_{4(aq)} + 3\ MgCl_{2(aq)} \rightarrow 1\ Mg_3(PO_4)_{2(s)} + 6\ NaCl_{(aq)}$
j.	HC	$2\ C_4H_{10(g)} + 13\ O_{2(g)} \rightarrow 8\ CO_{2(g)} + 10\ H_2O_{(g)}$
k.	D	$2\ P_2O_{5(s)} \rightarrow 1\ P_{4(s)} + 5\ O_{2(g)}$
l.	SR	$2\ Al_{(s)} + 3\ Cu(NO_2)_{2(aq)} \rightarrow 3\ Cu_{(s)} + 2\ Al(NO_2)_{3(aq)}$
m.	DR	$1\ CaC_{2(s)} + 2\ \overset{HOH}{H_2O_{(l)}} \rightarrow 1\ C_2H_{2(g)} + 1\ Ca(OH)_{2(s)}$

2. For each of the following word equations or descriptions, write and balance an equation to represent the reaction. Identify the type of reaction.

   a. Magnesium reacts with hydrochloric acid to form magnesium chloride and hydrogen gas, H_2.

   $1\ Mg_{(s)} + 2\ HCl_{(aq)} \rightarrow 1\ MgCl_{2(aq)} + 1\ H_{2(g)}$

   b. Aluminum metal reacts with iron(III) oxide to form iron metal and aluminum oxide.

   $2\ Al_{(s)} + 1\ Fe_2O_{3(s)} \rightarrow 2\ Fe_{(s)} + 1\ Al_2O_{3(s)}$

c. Calcium hydroxide reacts with sulfuric acid to produce calcium sulfate and water.

$1\,Ca(OH)_{2(s)} + 1\,H_2SO_{4(aq)} \longrightarrow 1\,CaSO_{4(s)} + 2\,HOH_{(l)}$

d. Elemental sulfur, S_8, reacts with oxygen gas, O_2, to form sulfur trioxide gas.

$1\,S_{8(s)} + 12\,O_{2(g)} \longrightarrow 8\,SO_{3(g)}$

e. Lead(II) oxide is decomposed into lead metal and oxygen gas, O_2.

$2\,PbO_{(s)} \longrightarrow 2\,Pb_{(s)} + 1\,O_{2(g)}$

f. Propane gas, C_3H_8, burns by combining with oxygen gas to produce carbon dioxide gas and water vapour.

$1\,C_3H_{8(g)} + 5\,O_{2(g)} \longrightarrow 3\,CO_{2(g)} + 4\,H_2O_{(g)}$

3. Writing and Balancing Equations

In doing these problems, refer to the classifications of reactions. Write balanced equations for the following.

F/SC a. $2\,H_{2(g)} + 1\,O_{2(g)} \rightarrow 2\,H_2O_{(l)}$

SD b. $2\,KCl_{(s)} \rightarrow 2\,K_{(s)} + 1\,Cl_{2(g)}$

SR c. $1\,Cl_{2(g)} + 2\,NaI \rightarrow 2\,NaCl_{(aq)} + 1\,I_{2(s)}$

DR d. $1\,KCl_{(aq)} + 1\,AgNO_{3(aq)} \rightarrow 1\,KNO_{3(aq)} + 1\,AgCl_{(s)}$

e. $1\,Pb_{(s)} + 1\,ZnBr_{2(aq)} \rightarrow 1\,PbBr_{2(aq)} + 1\,Zn_{(s)}$

f. $1\,BaCl_{2(aq)} + 1\,Na_2SO_{4(aq)} \rightarrow 1\,BaSO_{4(s)} + 2\,NaCl_{(aq)}$

HC g) $1\,C_3H_{8(g)} + 5\,O_{2(g)} \rightarrow 3\,CO_{2(g)} + 4\,H_2O_{(g)}$

1. Calculate the molar mass of the following compounds:

Formula	Name	Molar Mass (g/mol)
$Na_2SO_{4(s)}$	sodium sulfate.	Na - 2 x 22.99 g/mol S - 1 x 32.09 g/mol = 142.05 g/mol O - 4 x 16.00 g/mol
$Ca(NO_3)_{2(s)}$		
$N_2O_{5(s)}$		
$K_2Cr_2O_{7(s)}$		
$Al_2O_{3(s)}$		
$(NH_4)_2SO_{4(s)}$		

atoms ÷ 6.02×10^{23} = n

3. Fill in the blanks of the following table:

Compound	Number of Atoms or Molecules	Number of Moles	Mass(g)
$NaCl_{(s)}$	6.02×10^{25}	100 mol	$n = \frac{m}{M}$ $100\ mol = \frac{m}{58.44\ g/mol}$
$AgNO_{3(s)}$	3.9×10^{23}	0.650	5844 g = m
$K_{(s)}$	1.50×10^{23}	n x 6.02×10^{23} = atoms	
$Zn_{(s)}$			200 g
$Cl_{2(g)}$		3.20	
$NaOH_{(s)}$			60.0 g
$HCl_{(g)}$	1.20×10^{25}		

Worksheet # 7 Moles

1. Calculate the molar mass of the following compounds:

Formula	Name	Molar Mass (g/mol)
$Na_2SO_{4(s)}$	sodium sulfate	~~22.99~~ Na - 2(22.99 g/mol) S - 1(32.06 g/mol) O - 4(16.00 g/mol) = 142.04 g/mol
$Ca(NO_3)_{2(s)}$	calcium nitrate	Ca - 1(40.08 g/mol) N - 2(14.01 g/mol) O - 6(16.00 g/mol) = 164.10 g/mol.
$N_2O_{5(s)}$	dinitrogen pentaoxide	N - 2(14.01 g/mol) O - 5(16.00 g/mol) = 108.02 g/mol
$K_2Cr_2O_{7(s)}$	potassium dichromate	K - 2(39.10 g/mol) Cr - 2(52.00 g/mol) O - 7(16.00 g/mol) = 294.20 g/mol.
$Al_2O_{3(s)}$	aluminium oxide.	Al - 2(26.98 g/mol) O - 3(16.00 g/mol) = 101.96 g/mol.
$(NH_4)_2SO_{4(s)}$	ammonium sulfate.	N - 2(14.01 g/mol) S - 1(32.06 g/mol) H - 8(1.01 g/mol) O - 4(16.00 g/mol) = 132.16 g/mol

3. Fill in the blanks of the following table:

Compound	Number of Atoms or Molecules	Number of Moles	Mass(g)
$NaCl_{(s)}$	6.02×10^{25}	100 mol	$n = \frac{m}{M}$ 100 mol = $\frac{m}{58.44 g/mol}$ = 5844 grams
$AgNO_{3(s)}$	3.913×10^{23}	0.650	0.65 mol = $\frac{m}{169.88}$ = 110.4 g
$K_{(s)}$	1.50×10^{23}	0.249 mol	0.249 mol = $\frac{m}{39.10 g/mol}$ = 9.7 g
$Zn_{(s)}$	1.87×10^{24}	$n = \frac{m}{M} = \frac{200 g}{65.38 g/mol}$ = 3.1 mol	200 g
$Cl_{2(g)}$	1.93×10^{24}	3.20	3.2 mol = $\frac{m}{70.9 g/mol}$ = 226.88 g
$NaOH_{(s)}$	9.03×10^{23}	$n = \frac{60 g}{40 g/mol}$ = 1.5 mol	60.0 g
$HCl_{(g)}$	1.20×10^{25}	19.9 mol	19.9 mol = $\frac{m}{36.46 g/mol}$ = 425.5 g

Remember: To find number of atoms from moles:

moles x 6.02×10^{23}

To find number of moles from atoms:

number of atoms ÷ 6.02×10^{23}

Worksheet # 8

Find the number of Moles or Mass of the following samples.

Compound	Name	Molar Mass	Number of Moles	Mass(g)
$CH_{4(g)}$	methane	16.05g/mol	35.4g / 16.05g/mol = 2.2 mol	34.7
$CuCl_{2(s)}$				115
$Ca(NO_3)_{2(s)}$				455
$CO_{2(g)}$				6.75
$ZnS_{(s)}$				885
$(NH_4)_2SO_{4(s)}$				75
$C_2H_{6(g)}$	ethane		2.55	
$MgBr_{2(s)}$			25.5	
$NiCl_{2(s)}$			33.4	
$Fe_2O_{3(s)}$			0.115	
$HCl_{(g)}$			5.75	
$K_2Cr_2O_{7(s)}$			0.0125	

Worksheet 8: Part 2 Mole Calculations

Complete the following table. Show all work as in the example.

Name and Formula	Molar Mass (M)	# Moles(n)	Mass(m)
Example: carbon tetrachloride $CCl_{4(l)}$ Toxic solvent	1 C = 1 x 12.01 = 12.01 4 Cl = 3 x 35.45 = 141.80 153.81 g/mol	1.2 mol **m = nM** CCl_4 = 1.2 mol x 153.81 g/mol = 1.8×10^2 g or 0.18 kg	
NaCl sodium chloride (table salt)	1 Na - 22.99 g/mol 1 Cl - 35.45 g/mol 58.44 g/mol.	0.25 mol $n = \frac{m}{M}$ $0.25\text{mol} = \frac{m}{58.44\text{g/mol}}$ $m = 14.61\text{ g}$	
$KOH_{(s)}$ (caustic soda)			4.61 g
$(NH_4)_2SO_{4(s)}$ (fertilizer)		0.400 mol	
sodium carbonate (washing soda)		0.22 mol	
$Ca(NO_3)_{2(s)}$	Ca - 1(40.08 g/mol) N - 2(14.01 g/mol) O - 6(16.00 g/mol) 164.10 g/mol	$n = \frac{m}{M}$ $n = \frac{8.20\text{g}}{164.10\text{g/mol}} = 0.05\text{ mol}$	8.20 g

Name and Formula	Molar Mass (M)	# Moles(n)	Mass(m)
sodium dichromate $Na_2Cr_2O_7$			13.1 g
sulfur dioxide		1.60 mol	
$K_2CO_{3(s)}$			82.8 g
aluminum oxide			25.5 g
$Cu(ClO_3)_{2(s)}$		2.50 mol	