South Pasadena • Chemistry Name_____ Period___

3 • What Happens When Chemicals Are Put Together?

1 • COMBUSTION REACTIONS

Write the balanced chemical equations for the combustion of the following fuels:

propane, C_3H_8

butane, C_4H_{10}

ethanol, C_2H_5OH

decane, $C_{10}H_{22}$

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2 • REACTION TERMS

There are several terms used throughout this unit.
Answer the questions with these terms:
solid, liquid, gas, aqueous, reactants, products, subscripts, coefficients, oxidation, reduction

Consider the following balanced chemical equation: $C_3H_8(g) + 5\ O_2(g) \rightarrow 3\ CO_2(g) + 4\ H_2O(l)$

1. The "8" in the equation is an example of a _____.
2. The "5" in the equation is an example of a _____.
3. $C_3H_8(g)$ and $O_2(g)$ are called _____.
4. The only liquid in the equation is _____.

Consider the following balanced chemical equation: $Zn(s) + 2\ HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

5. Which chemicals are dissolved in water? _____ and _____.
6. The change of $Zn(s) \rightarrow Zn^{2+}(aq)$ is called _____ (oxidation / reduction).

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3 • BALANCING EQUATIONS

Balance the following equations:

1. __C_4H_{10} + __O_2 → __CO_2 + __H_2O

2. __$C_7H_6O_2$ + __O_2 → __CO_2 + __H_2O

3. __P_4O_{10} + __H_2O → __H_3PO_4

4. __FeS_2 + __O_2 → __Fe_2O_3 + __SO_2

5. __NH_3 + __O_2 → __NO + __H_2O

6. __Fe + __HCl → __H_2 + __$FeCl_2$

7. __Al + __Fe_3O_4 → __Al_2O_3 + __Fe

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4 • CLASSIFYING REACTIONS

For each of the following equations, classify the reaction as:

C—combusion	DR—double replacement	SR—single replacement	S—synthesis	D—decomposition

___ ZnS + 2 HCl → $ZnCl_2$ + H_2S

___ 2 HCl + Zn → $ZnCl_2$ + H_2

___ 2 H_2 + O_2 → 2 H_2O

___ 3 $Ca(OH)_2$ + 2 H_3PO_4 → $Ca_3(PO_4)_2$ + 6 H_2O

___ 8 Al + 3 Fe_3O_4 → 4 Al_2O_3 + 9 Fe

___ C_5H_{12} + 8 O_2 → 5 CO_2 + 6 H_2O

___ 2 H_2O_2 → 2 H_2O + O_2

___ CaO + CO_2 → $CaCO_3$

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5 • PRECIPITATION REACTIONS

Circle the compounds below that would be precipitates (compounds that do not dissolve in water):

$K_2Cr_2O_7$	$Fe(NO_3)_3$	CuOH	$MgCO_3$
Ag_3PO_4	$BaSO_4$	$PbCl_2$	$CaCl_2$

Write the balanced molecular equation given the following information:

silver nitrate + sodium carbonate → silver carbonate + sodium nitrate

Write the ionic equation from this molecular equation. <u>Underline</u> the "spectator ions."

$2\ Fe(NO_3)_3(aq) + 3\ Ca(OH)_2(aq) \rightarrow 2\ Fe(OH)_3(s) + 3\ Ca(NO_3)_2(aq)$

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6 • IONIC COMPOUNDS

Write the compound formed from these ions:

# Cations	Cation	# Anions	Anion	Formula
2	NH_4^+	1	SO_4^{2-}	
2	Fe^{3+}	3	S^{2-}	
1	Cu^{2+}	2	$C_2H_3O_2^-$	

Determine the # of ions needed to make a neutral compound and then write the formula:

# Cations	Cation	# Anions	Anion	Formula
	NH_4^+		PO_4^{3-}	
	Ba^{2+}		NO_3^-	
	Al^{3+}		CO_3^{2-}	
	Sr^{2+}		OH^-	

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7 • NAMING ACIDS

Write the formula of the acid formed from the following anions.

anion	acid formula	anion	acid formula	anion	acid formula
Cl^-		SO_4^{2-}		MnO_4^-	
OH^-		PO_4^{3-}		F^-	
S^{2-}		$C_2H_3O_2^-$		NO_3^-	

Name the following acids:

formula	acid name	formula	acid name	formula	acid name
HBr		HI		H_2CO_3	
HNO_3		$H_2Cr_2O_7$		H_2S	
$HC_2H_3O_2$		$HClO_3$		H_3PO_4	

Given the anion, write the formula of the acid and then name it:

anion	formula	acid name	anion	formula	acid name
S^{2-}			SO_4^{2-}		
Cl^-			ClO_3^-		
NO_3^-			F^-		
$C_2H_3O_2^-$			CO_3^{2-}		

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8 • CHEMICAL MATH

Consider the following balanced equation: $C_3H_8(g) + 5\ O_2(g) \rightarrow 3\ CO_2(g) + 4\ H_2O(g)$

Molar Masses: 45.01 32.00 44.01 18.02 g/mol

1. What mass of CO_2 is formed when 100 grams of C_3H_8 react?

2. What volume (at STP) of $O_2(g)$ is needed to completely react with 7.55 grams of C_3H_8?

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9 • NATURAL HISTORY OF AIRS

Match the following ideas with the three gases:

O – oxygen gas H – hydrogen gas C – carbon dioxide gas

___1. formed from hydrogen peroxide + yeast

___2. also called “inflammable air”

___3. formed from vinegar + chalk

___4. also called “dephlogisticated air”

___5. formed from hydrochloric acid + zinc

___6. also called “fixed air”

___7. turns limewater cloudy

___8. pops with a burning splint

___9. glowing splint re-lights

Match these substances with their chemical formulas:

___10. chalk a) HCl

___11. limewater b) $CaCO_3$

___12. vinegar c) $Ca(OH)_2$

___13. hydrochloric acid d) H_2O_2

___14. hydrogen peroxide e) $HC_2H_3O_2$