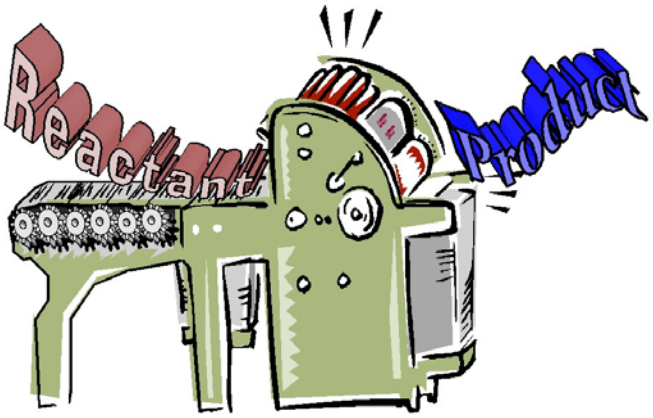
Chemistry: Form WS5.3.1A Name _____

CHEMICAL FORMULAS AND EQUATIONS Date _____ Period _____

Understanding Chemical Equations



Chemical reactions are like mini-factories. Reactants go in, and products come out. Chemical equations provide a shorthand way to easily describe what occurs during a chemical reaction. In a typical chemical equation, the reactants are written on the left, while the products are written on the right. The reactants and products are separated by an arrow, or yield sign, which indicates that reactants yield products. (**REACTANTS** → **PRODUCTS**) There are other symbols as well that show the state of the chemicals involved in the reaction. They are: (*s*) or ↓ for a solid precipitate; (ℓ) for a liquid; (*g*) or ↑ for a gas; and (*aq*) for dissolved in water or aqueous. Symbols can also be used to show other factors involved in the reaction such as sources of energy used. These include: Δ for heat or ↑| for light. These symbols are written above or below the yield sign because they are neither reactants nor products. The complete equation shows the identity of the reactants and products using chemical formulas and symbols, the phases of the reactants and products, any energy changes involved in the reaction, and the mole ratios of all the substances indicated by the coefficients. Equations may occasionally be written omitting information about phases or energy changes. The example below shows a complete chemical equation with all the components.

$$2KClO_3(s) \xrightarrow[\Delta]{\mathbf{MnO_2}(s)} 2KCl(s) + 3O_2(g)$$

In the above reaction, the equation shows that the reactant is solid potassium chlorate, the products are solid potassium chloride and oxygen gas, manganese dioxide is a catalyst, and the reaction is endothermic. Symbols for manganese dioxide and heat are shown above and below the yield sign because they are neither reactants nor products.

For each of the chemical equations below, identify the reactants and the products, state what phase each is in, and state the mole ratios of all the products and reactants. See the sample below.

Chemical Equation	Reactants		Products		Ratio
	Identity	Phase	Identity	Phase	
Sample: • $2H_2(g) + O_2(g) \rightarrow 2H_2O(\ell)$	H_2 O_2	gas gas	H_2O	liquid	2:1:2
[A] $3Ca(NO_3)_2(aq) + 2Na_3PO_4(aq) \rightarrow 6NaNO_3(aq) + Ca_3(PO_4)_2(s)$					

Chemical Equation	Reactants		Products		Ratio
	Identity	Phase	Identity	Phase	
[B] $CO_2(g) + H_2O(\ell) \rightarrow H_2CO_3(aq)$					
[C] $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$					
[D] $Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$					
[E] $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$					
[F] $2Fe(OH)_2(s) + H_2O_2(aq) \rightarrow 2Fe(OH)_3(s)$					
[G] $3Cu(s) + 8HNO_3(aq) \rightarrow 2NO(g) + 3Cu(NO_3)_2(g) + 4H_2O(\ell)$					
[H] $2Li(s) + 2H_2O(\ell) \rightarrow 2LiOH(aq) + H_2(g)$					
[I] $H_2O(\ell) + N_2O_5(g) \rightarrow 2HNO_3(aq)$					
[J] $2Al(s) + 3Zn(NO_3)_2(aq) \rightarrow 3Zn(s) + 2Al(NO_3)_3(aq)$					