

Chemistry

Lesson: 4/7/20

Learning Topic:

Students will be able to predict products of chemical reactions.

Prior Knowledge Questions

1. Name two chemical reactions. Hint there are 5 types of chemical reactions.
2. What cues help indicate a chemical reaction has occurred?

Prior Knowledge Answers

1. Synthesis/combination, decomposition, single replacement, double replacement, and combustion (complete and incomplete)
2. Irreversible change to composition of substance, Production of gas, change in color, etc.

Learning Material

Watch the following video:


[Predicting Chemical Reactions Video](#)


While watching video answer the following questions:

1. Why does the presenter have a specific list of elements on the right side of his slide?
2. What is always the first step for predicting products?
3. Why should you never bring over subscripts when predicting products?
4. What condition should you check when doing a single replacement reaction?
5. What condition should you check when doing a double replacement reaction?

Learning Material Continued

As mentioned in the video Single Replacement Reactions only occur as long as the element you are replacing is higher on the Reactivity Series. This can be for metals (this list is pictured to the right) or non-metals (this list is pictured below).

Activity Series of Non-Metals		
Most reactive	fluorine	F
	chlorine	Cl
	oxygen	O
	bromine	Br
	iodine	I
	sulfur	S
Least reactive	(red) phosphorus	P

K	Potassium		Most reactive
Na	Sodium		Reactivity decreases
Ca	Calcium		
Mg	Magnesium		
Al	Aluminium		
Zn	Zinc		
Fe	Iron		
Pb	Lead		
H	Hydrogen		
Cu	Copper		
Hg	Mercury		
Ag	Silver	Least reactive	
Au	Gold		

Learning Material

Not mentioned in the video, Double Replacement Reactions can only occur if a solid, liquid water, or gas is produced. In order to determine if a solid is formed, you must refer to the solubility rules (pictured below). Watch out for wording:

- Soluble = dissolves in water (aq)
- Insoluble = does not dissolve in water (s)

Ion	General Solubility Rule
NO_3^-	All nitrates are soluble
$\text{C}_2\text{H}_3\text{O}_2^-$	All acetates are soluble ($\text{AgC}_2\text{H}_3\text{O}_2$ only moderately)
Cl^- , Br^- , I^-	All chlorides, bromides and iodides are soluble except Ag^+ , Pb^+ and Hg_2^{2+} . (PbCl_2 is slightly soluble in cold water and moderatel soluble in hot water.)
SO_4^{2-}	All sulfates are soluble except those of Ba^{2+} , Pb^{2+} , Ca^{2+} and Sr^{2+}
CO_3^{2-} and PO_4^{3-}	All carbonates and phosphates are insoluble except those of Na^+ , K^+ and NH_4^+ . (Many acid phosphates are soluble).
OH^-	All hydroxides are insoluble except those of Na^+ and K^+ . Hydroxides of Ba^{2+} and Ca^{2+} are slightly soluble.
S^{2-}	All sulfides are insoluble except those of Na^+ , K^+ , NH_4^+ and those of the alkaline earths: Mg^{2+} , Ca^{2+} , Sr^{2+} and Ba^{2+} . (Sulfides of Al^{3+} and Cr^{3+} hydrolyze and precipitate as the corresponding hydroxides.
Na^+ , K^+ and NH_4^+	All salts of sodium ion, potassium ion and ammonium ion are soluble except several uncommon ones.

Learning Material Continued

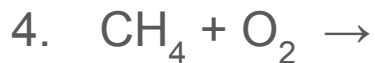
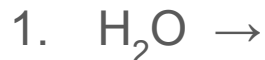
Combustion reactions have technically two types of reactions - Complete Combustion and Incomplete Combustion.

Complete combustion occurs when a combustion reaction has significant amount of oxygen to react with the hydrocarbon molecule (compound that is made up of mostly carbon and hydrogen). When this happens the reaction products are carbon dioxide (CO_2) and water (H_2O).

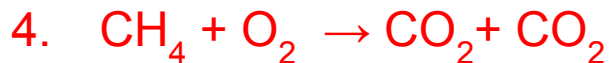
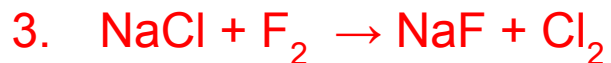
Incomplete combustion occurs when a combustion reaction does not have enough oxygen to react with the hydrocarbon molecule. When this happens the reaction products are carbon monoxide (CO) and water (H_2O).

Complete the following Practice Problems:

Determine the products of the following reactions. If it is a combustion reaction, assume it is a complete combustion reaction. If it is a decomposition reaction, it will decompose into its elements.



Use this Answer Key to Review your Practice:



Extensions to Learning:

Extra information:

[Predicting Reaction Products](#)

Practice Worksheets:

[Equations and Reactions](#)

- Every worksheet on this site are great practice problems to use.