# Chemical Reactions #2

# Single Replacement

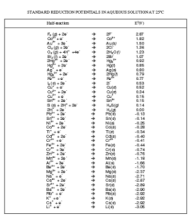
- Element + Compound → Element + Compound
- A + BX → AX + B
- Can have metal & metal replacement, halogen & halogen replacement, or metal & hydrogen replacement

# Single Replacement

- Need to know your activity series!
- Just look at your Standard Reduction Potential Table

Weakest

Strongest



# Single Replacement

- Magnesium turnings are added to a solution of ferric chloride

## Single Replacement

- Sodium is added to water
- Whenever water is added to an element visualize it as HOH (make sure you re write it as $H_2O$)

## Single Replacement

- Chlorine gas is bubbled into a solution of potassium fluoride

## Double Replacement

- **Double Replacement** – a reaction involving the exchange of ions between 2 compounds
- Of the form: AX + BY → BX + AY

## Double Replacement

- In order for a double replacement reaction to take place, one of 3 things must be formed:
- Precipitate (solid)
- Gas
- Weak electrolyte

## Solubility Rules!!!

**SOLUBILITY RULES**

*Always soluble:*

alkali metal ions ($Li^+$, $Na^+$, $K^+$, $Rb^+$, $Cs^+$), $NH_4^+$, $NO_3^-$, $ClO_3^-$, $ClO_4^-$, $C_2H_3O_2^-$

*Generally soluble:* (mnemonics)

$Cl^-$, $Br^-$, $I^-$ Soluble except $Ag^+$, $Pb^{2+}$, $Hg_2^{2+}$ (AP/H)

$F^-$ Soluble except $Ca^{2+}$, $Sr^{2+}$, $Ba^{2+}$, $Pb^{2+}$, $Mg^{2+}$ (CBS-PM)

$SO_4^{2-}$ Soluble except $Ca^{2+}$, $Sr^{2+}$, $Ba^{2+}$, $Pb^{2+}$ (CBS/PBS)

*Generally insoluble:*

$O^{2-}$, $OH^-$ Insoluble except and alkali metals, and $NH_4^+$ $Ca^{2+}$, $Sr^{2+}$, $Ba^{2+}$ (CBS) somewhat soluble

$CO_3^{2-}$, $PO_4^{3-}$, $S^{2-}$, $SO_3^{2-}$, $C_2O_4^{2-}$, $CrO_4^{2-}$ Insoluble except alkali metals and $NH_4^+$

## Double Replacement # 1 (Precipitate)

1. Precipitate (must know solubility rules)…the precipitate will stay together

- A saturated solution of barium hydroxide is mixed with a solution of iron (III) sulfate

## Double Replacement # 2 (Formation of a gas)

2. Formation of a gas (acid + sulfide, sulfite, carbonate, or bicarbonate…or ammonium salt + a strong base → $NH_3(g)$, $H_2O$, and a salt)

- Hydrobromic acid is added to a solution of potassium bicarbonate

## Double Replacement # 3

3. Metal hydride + water → $H_2$ + strong base (IONS)

- Sodium hydride is placed into water

## Double Replacement #4 (Acid Base neutralization)

- Acid + base → salt + water
- Hydrogen sulfide gas is bubbled through excess potassium hydroxide solution

## Combustion

1. Hydrocarbon + $O_2$→ $CO_2$+ $H_2O$ (No ions)
- Combustion of methane