**Balancing Single Replacement Reactions**

In a **single replacement** reaction, the cation (usually a metal) in a compound is replaced by another, more reactive metal. They always follow this format:



As an example, look at this chemical equation for single replacement reaction between solid lithium and a solution of iron (II) nitrate.

Li(s) +Fe(NO3)2(aq) → Fe(s) + LiNO3(aq)

Lithium replaced iron (II) in the compound. Iron was left alone as a solid product. This reaction, however, is not balanced. Count the atoms. You might find it helpful to treat the nitrate polyatomic ion as a single element in balancing.

**Reactants** **Products**

Li = \_ Li = \_\_\_\_\_\_\_

Fe = \_ Fe = \_\_\_\_\_\_\_

NO3 = \_ NO3 = \_\_\_\_\_\_\_

Add coefficients to balance the equation and satisfy the Law of Conservation of Matter.

\_\_\_Li(s) +\_\_\_Fe(NO3)2(aq) → \_\_\_Fe(s) + \_\_\_LiNO3(aq)

Not all combinations of elements and compounds in single replacement reactions will actually react! You can use the **activity series** of metals to predict this. Follow these two rules:

1. *Highly reactive metals prefer to be part of a compound.*
2. *Highly stable metals prefer to be alone.*

Look at the following combinations. If they will react, then predict what the products will be. If they will not react, then write NR for o reaction”.

K + Cu2SO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Al + BaCl2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mg + AlPO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Practice**

Balance each of these single replacement equations.

1. Cu (s) + AgNO3(aq) → Cu(NO3)2(s) + Ag(s)
2. Li(s) + MgCO3(aq)→ Li2CO3(s) + Mg(s)
3. K(s) + H2O(aq)→ KOH(s) + H2(s)
4. Ba(s) + HgIO3(aq)→ Ba(IO3)2(s) + Hg(s)

1. Cr(s) + Fe(OH)2(aq)→ Cr(OH)3(s) + Fe(s)

Write a complete, balanced chemical equation for each single replacement reaction. Include subscripts, and state of matter notation as needed. Don’t forget about the diatomic elements! *If no reaction is to occur, write “NR”*.

1. Hydrochloric acid (HCl) is mixed with solid magnesium.

Write and balance the chemical equation:

1. Gold metal is placed inside a test tube with phosphoric acid (H3PO4)

Write and balance the chemical equation:

1. Solid tin is mixed into a solution of lithium sulfate
2. Write the formula for lithium sulfate:
3. Write and balance the chemical equation:
4. Potassium metal is added to a solution of manganese (II) oxide
5. Write the formula for lithium sulfate:
6. Write and balance the chemical equation: