

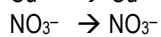
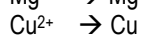
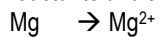
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Single Replacement Reactions: A Step-by-Step Guide

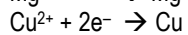
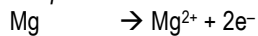
Example	Practice
<p style="text-align: center;">Magnesium metal is added to copper (II) nitrate</p> <p>1. Write formulas for the reactants. For any ionic compounds (metal + nonmetal), you have to find the charge of each ion:</p> <p>Mg: No charge, since it is in its elemental form Cu²⁺: Copper is a transition metal, so its charge was indicated by the roman numerals NO₃¹⁻: Nitrate is a polyatomic ion that you memorized!</p> <p>Now put them together and cross the charges into subscripts: Mg + Cu²⁺NO₃¹⁻</p> <p>You will need parentheses around nitrate because it is polyatomic and you have more than one. Reduce the subscripts whenever they have a common denominator.</p> <p style="text-align: center;">Mg + Cu(NO₃)₂</p>	<p style="text-align: center;">Lithium metal is added to calcium nitrate</p>
<p>2. Identify the type of reaction by the pattern of the reactants:</p> <p>A + BX → AX + B is a SR reaction. Mg + Cu(NO₃)₂ →</p> <p>The negative ion could also be replaced. That would have the form of: Y + BX → BY + X</p>	
<p>3. Predict the products, based on the reaction type.</p> <p>If you have the A + BX pattern, turn the lone metal into an ion (with a charge) and turn the metal ion into a lone metal (with no charge):</p> <p>A + BX → AX + B Mg + Cu(NO₃)₂ → Mg²⁺____ + Cu</p> <p>Fill in the negative ion with the new metal ion:</p> <p>A + BX → AX + B Mg + Cu(NO₃)₂ → Mg²⁺NO₃¹⁻ + Cu</p> <p>Now cross the charges into subscripts, using parentheses around the polyatomic ions. Reduce the subscripts if there is a common denominator.</p> <p>A + BX → AX + B Mg + Cu(NO₃)₂ → Mg(NO₃)₂ + Cu</p>	
<p>4. Balance the reaction. Change only the coefficients, NOT subscripts! Just work your way from left to right, balancing each ion you encounter.</p> <p>Balance Mg: 1Mg + __Cu(NO₃)₂ → 1Mg(NO₃)₂ + __Cu</p> <p>Balance Cu: 1Mg + 1Cu(NO₃)₂ → 1Mg(NO₃)₂ + 1Cu</p> <p>Balance NO₃ and double-check the others: 1Mg + 1Cu(NO₃)₂ → 1Mg(NO₃)₂ + 1Cu</p>	
<p>5. Now check if the reaction will occur by comparing the activities of the atoms that were competing.</p> <p>Here, Mg competed with Cu to bond with NO₃. Mg is higher on the activity series than Cu, so Mg will take its place. This reaction <u>will occur</u>.</p> <p>If this were a non-metal replacement reaction, you would compare the activities of the non-metals.</p>	

6. Finally, you can determine the movement of the electrons in the reaction.

Go back to steps 1 & 3 where you determined the charges of the reactants and the products:



Here, Mg lost electrons to become a positive ion. Cu^{2+} gained those electrons to become neutral. NO_3^- 's charge did not change, so it did not participate in the electron exchange. The half-reactions can be completed:



More Practice!

1. Lead (II) nitrate and cadmium

2. Tin (IV) chloride and silver

3. Barium and Sodium hydroxide

4. Zinc and nickel (III) chloride

5. Magnesium phosphate and aluminum