

## Tutorial: Types of Chemical Reactions

### Slide 1:

We can classify most chemical reactions into four general categories. The first category is the synthesis reactions. In a synthesis reaction, two or more simple substances combine to form a more complex substance. Here you see how carbon combines with oxygen to form carbon dioxide. This is a common reaction that takes place every time carbon-bearing materials like coal or gasoline are burned in the presence of oxygen to release carbon dioxide gas.

### Slide 2:

If you have any silver jewelry or other items made of silver, you may have noticed that silver is prone to becoming tarnished, or blackened, over time. This is due to a synthesis reaction. The silver reacts with sulfur in the air to form silver sulfide, the black material we call tarnish. The reaction is represented by this formula. Notice the reactants are on the left and the product is on the right.

### Slide 3:

The next type of chemical reaction is the decomposition reaction, which is just what it sounds like. In a decomposition reaction, a complex substance breaks down to simpler substances. A single reactant breaks down into two or more products.

### Slide 4:

The fizz in your soda comes from a compound called carbonic acid. Over time your soda becomes flat, or loses its fizz, because the carbonic acid decomposes to water and carbon dioxide gas. The carbon dioxide gas escapes into the atmosphere and the water is left behind in your soda. This example of a decomposition reaction looks like this.

### Slide 5:

Next, we have single displacement reactions. These reactions involve a single uncombined element replacing another element in a compound. For example, here you see how zinc, represented by the symbol Zn replaces hydrogen, represented by the symbol H. The cartoon shows you a fun way to remember how a single displacement reaction works—it's like a single friend coming along and breaking up a pair by replacing one of the two in the pair.

### Slide 6:

Here you see a solid piece of metal immersed in a test tube filled with hydrochloric acid. The metal is magnesium. When it reacts with the hydrochloric acid, it displaces hydrogen gas. The single displacement reaction looks like this.

### Slide 7:

Finally, there are the double displacement reactions. In a double displacement reaction, the parts of two compounds switch places to form two new compounds. For example, here you see how silver, represented by the symbol Ag, and sodium, represented by the symbol Na, switch places. Two entirely new compounds are formed. As the cartoon shows, you can think of a double displacement reaction as two pairs of friends switching partners.

**Slide 8:**

Antacids are a type of medicine taken to neutralize excessive acid in the stomach. The antacid is made of a compound called calcium hydroxide. The stomach acid is hydrochloric acid. This is an example of a double displacement reaction. Notice how calcium, represented by the symbol Ca, and hydrogen, represented by the symbol H, switch places.