Describing chemical reactions

Who?  a chemical reaction

Where?  solid, liquid, gases phases

What?  types of reactions

How?  reaction mechanisms

When?  kinetics

Why?  thermodynamics and equilibrium
What is happening in a chemical reaction?  

**types of reactions**

1) **Addition**

\[ \text{A} + \text{B} \rightarrow \text{C} \]

2) **Elimination**

\[ \text{A} \rightarrow \text{B} + \text{C} \]
3) Substitution

\[ A-B + C-D \rightarrow A-C + B-D \]

4) Rearrangement
How is a chemical reaction happening? *reaction mechanisms*

A reaction mechanism is the process by which chemical bonds are broken and formed in sequence so as to convert starting reagents into the observed products.

There are three ways to break and to make covalent bonds:

*homolytic bond cleavage / homogenic bond formation*

\[
\text{H} - \text{Br} \quad \rightarrow \quad \text{H} \cdot \quad \cdot \text{Br} \\
\text{(radicals)}
\]

\[
\text{H} \cdot \quad \cdot \text{Br} \quad \rightarrow \quad \text{H} - \text{Br}
\]

reactions involving radicals and sequential homoytic bond cleavage are called *radical reactions.*
reactions involving ions and sequential heterolytic bond cleavage are called polar reactions.
Simultaneous bond cleavage / bond formation

Reactions that occur in one step without intermediates of any kind are called nonpolar concerted reactions.