

## 1.1: Introduction- Reaction Kinetics

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How can you confirm through experiment that a reaction is happening in a particular way? What is the mechanism of the reaction? What intermediates are occurring, and in what order do the bond-making and bond-breaking steps take place?

There are lots of experiments people perform to work out how reactions happen. One of the methods used is chemical kinetics, in which the rate of a reaction is measured. By making changes in the reaction conditions and measuring the effect of the changes on the rate of reaction, we can infer what is going on at the molecular level.

- Chemical kinetics is the measurement of how quickly reactions occur.
- If changes in conditions affect the speed of reaction, we can learn something about how the reaction happens.

Kinetic studies are important in understanding reactions, and they have practical implications, too. For example, in industry, reactions are conducted in reactors in which compounds are mixed together, possibly heated and stirred for a while, and then moved to the next phase of the process. It is important to know how long to hold the reaction at one stage before moving on, to make sure that reaction has finished before starting the next one.

By understanding how a reaction takes place, many processes can be improved. For example, if we know that a particular intermediate is involved in a reaction, we might avoid the use of conditions (such as certain solvents) that are incompatible with that intermediate. We might also be able to think of reagents to add that would make certain steps in the reaction happen more easily.

Not only are kinetic studies important in industry, but they are also used to understand biological processes, especially enzyme-catalyzed reactions. They also play a role in environmental and atmospheric chemistry, as part of an effort to understand a variety of issues ranging from the fate of prescription pharmaceuticals in wastewater to the cascade of reactions involved in the ozone cycle.

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