What is a rate?

A rate is the measure of the speed of a change that occurs within an interval of time.

Example: Speed is a rate of distance travelled per unit of time (80 km/h or 15 m/s).

In chemistry, the rate of a chemical change or reaction rate is usually expressed as the amount of reactant changing per time.

Example: The rate at which iron rusts is 0.5 mol/year.
Assume equal time intervals between boxes, can you tell if the rate of the reaction is constant or not throughout the reaction?

Collision Theory

Atoms, ions and molecules can react to form products when they collide with one another, providing the colliding particles have enough energy. If not, they will just bounce off each other.

Key ideas:
- to react, must come in contact
- to react, must have enough energy

Activation Energy

The minimum energy that particles need to have in order to react is called the activation energy.

Think of it like a barrier that needs to be crossed in order for a reaction to occur.
1. Which are higher energy - reactants or products?

2. Is energy absorbed or released going from reactants to activated complex?

3. Will the activated complex always go to products or can it remain as it is?
The activation complex, also called the transition state, is an unstable combination of atoms. It cannot exist for long. Usually they exist for about $10^{-13}$ seconds. It will either reform as reactants or turn to products.

**Journal Review:**
- Define *rate of reaction*. What units are used?
- Explain *collision theory*.
- What is an activated complex and why does it not exist for long?

**Page 545-547:**
What are the factors affecting reaction rates and why?
- Pink - temperature
- Orange - concentration
- Blue - particle size
- Yellow - catalyst

**Collision worksheet**