

Section 12.7

Catalysis



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Learning Objectives

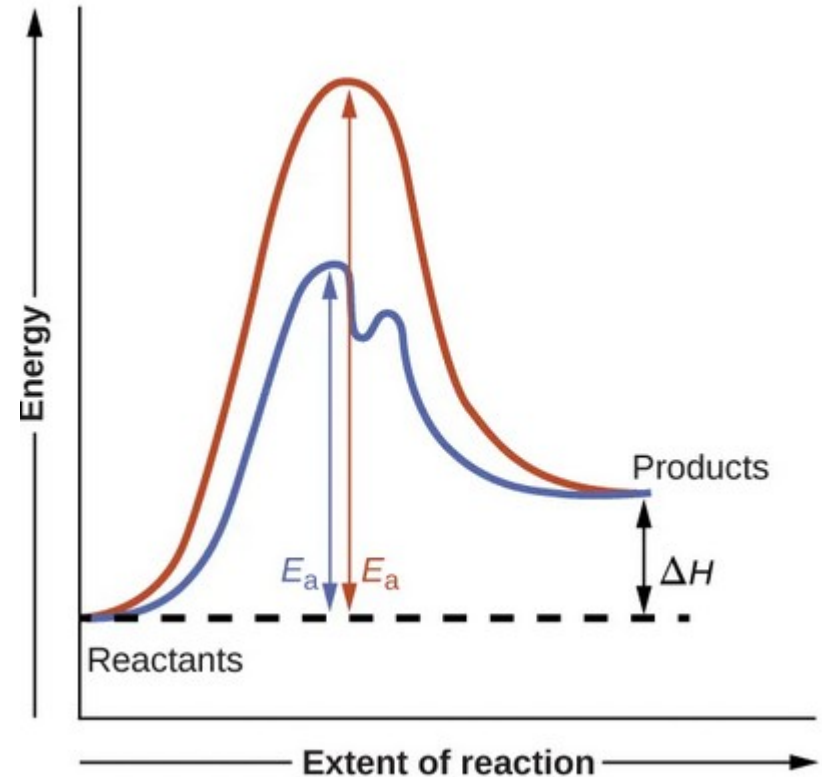


- Explain the function of a catalyst in terms of reaction mechanisms and potential energy diagrams
- List examples of catalysis in natural and industrial processes

Catalysts



- A **catalyst** is a substance that can increase the reaction rate without being consumed in the reaction.
- Catalyzed reactions will have alternate reaction mechanism with a lower activation energy.



Homogeneous Catalysts



- A **homogeneous catalyst** is present in the same phase as the reactants.
- It interacts with a reactant to form an intermediate substance
- The intermediate decomposes or reacts with another reactant to regenerate the original catalyst and form product.

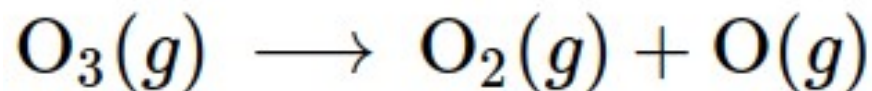
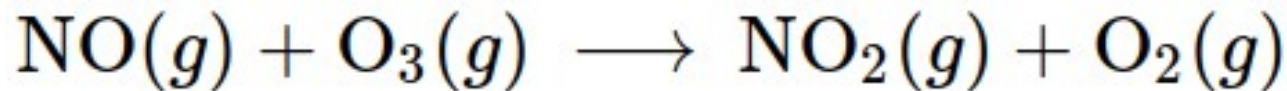
Homogeneous Catalyst Example



- Uncatalyzed Reaction



- Catalyzed Reaction



Heterogeneous Catalysts



- A **heterogeneous catalyst** is a catalyst that is present in a different phase (usually a solid) than the reactants.
- They typically provide a surface able to distort and align the reactants.
 - 1) Adsorption of the reactant(s) onto the surface of the catalyst
 - 2) Activation of the adsorbed reactant(s)
 - 3) Reaction of the adsorbed reactant(s)
 - 4) Desorption of product(s) from the surface of the catalyst

Picturing the Process



- Many important chemical products are prepared via industrial processes that use heterogeneous catalysts, including ammonia, nitric acid, sulfuric acid, and methanol.

