

Reaction Rates

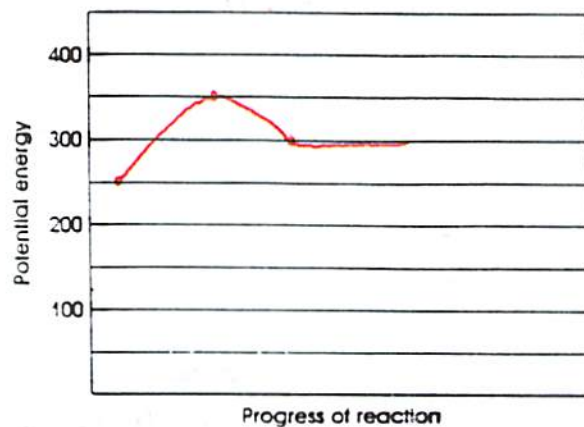
A. Potential Energy Diagrams

The potential energy of substances involved in a reaction can be plotted versus the progress of the reaction, as the process moves from initial reactants, through activated complex, to final products.

On the grids below, plot energy diagrams for 1-3 below, given the following information, and answer the questions. For number 4, study the energy diagram and answer the questions.

- 1 Potential energy of reactants: 250
 Potential energy of activated complex: 350
 Potential energy of products: 300
 Is the reaction exothermic or endothermic? How can you tell?
 What is the value of ΔH ?

endothermic
 $\Delta H = 300 - 250 = +50$
positive ΔH



If a catalyst were added, what would happen to the diagram? What would happen to the energies of reactants, products, and activated complex, and to the rate? Explain the effect on the rate.

- ① P.E. of act. comp. would be lowered
 ② same, same, lowered
 ③ increase the rate

- 2 Potential energy of reactants: 350
 Activation energy (energy needed to form activated complex from reactants): 100
 Potential energy of products: 250
 Is this reaction exothermic or endothermic? Why? What is the value of ΔH ?

- ① exothermic
 ② neg ΔH
 ③ $\Delta H = 250 - 350 = -100$



What is the potential energy of the activated complex? 450

If the concentration of the reactants were increased, what would happen to the diagram? What would happen to the energies of reactants, products, and activated complex, and to the rate?

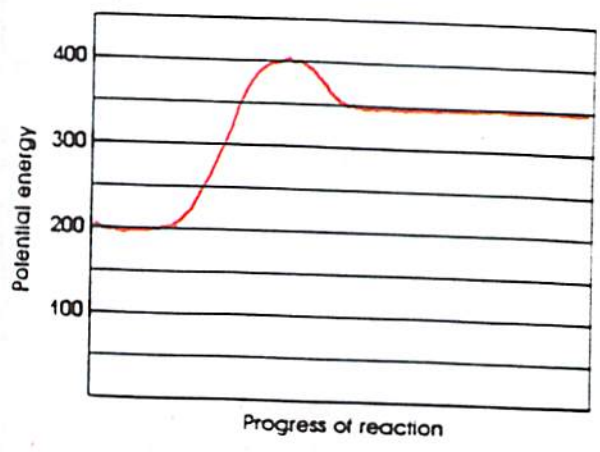
Explain the effect on the rate. (1) diagram - same
(2) react - same act. comp. - same
& products - same
(3) rate increase

3. Potential energy of reactants: 200
 Potential energy of activated complex: 400
 $\Delta H = +150$

Is this reaction exothermic or endothermic? Why?

endothermic
+ ΔH

What is the potential energy of the products? 350



What is the activation energy? 200

If temperature were increased, what would happen to the diagram? What would happen to the energies of reactants, products, and activated complex, and to the rate? Explain the effect on the rate.

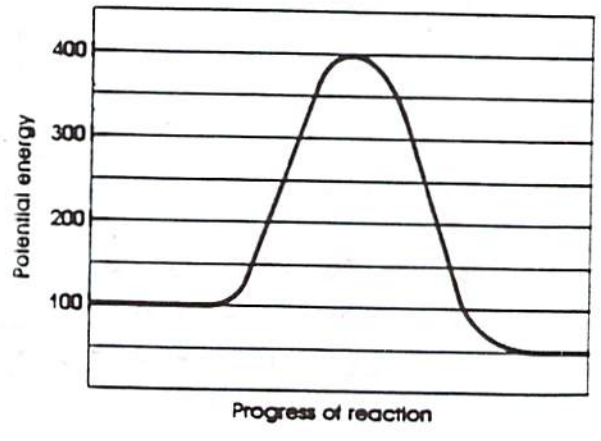
(1) diagram - same
(2) react - same act. comp. - same
prod - same -
(3) rate - increase

4. Potential energy of reactants: 100
 Potential energy of activated complex: 400

Activation energy: 300

Potential energy of products: 50

ΔH : -50



Is the reaction exothermic or endothermic? Why? exothermic, - ΔH