LECTURE 10

EXEMPLAR :

Q1

Consider the figure and mark the correct option.

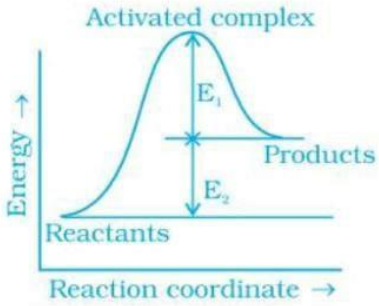


Fig. 4.1

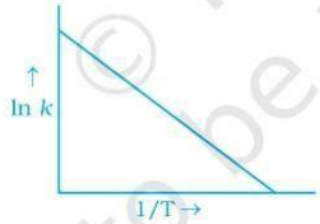
(i) Activation energy of forward reaction is $E_1 + E_2$ and product is less stable than reactant.
(ii) Activation energy of forward reaction is $E_1 + E_2$ and product is more stable than reactant.
(iii) Activation energy of both forward and backward reaction is $E_1 + E_2$ and reactant is more stable than product.
(iv) Activation energy of backward reaction is E_1 and product is more stable than reactant.

Ans. **(i)**
Explanation: The energy to form the reaction intermediate is called activation energy. The energy gap between reactant and product molecule=$E_1 + E_2$ some energy is released when complex decomposes to form product.

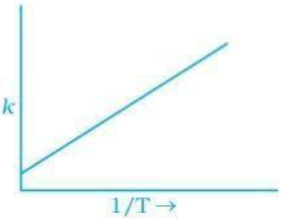
Q2)

6. According to Arrhenius equation rate constant k is equal to $A\,e^{-E_a/RT}$. Which of the following options represents the graph of ln k vs $\frac{1}{T}$?

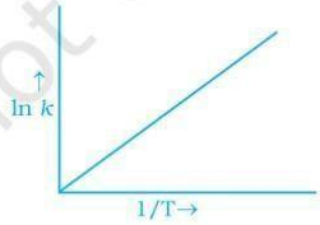
(i)



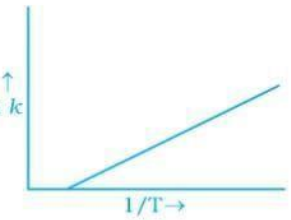
(ii)



(iii)



(iv)



Ans. **(i)**

Explanation: In the Arrhenius equation, the factor $k = Ae^{-E_a/RT}$ corresponds to the fraction of molecules that have kinetic energy greater than E_a.

Taking natural logarithm of both sides of equation

$$\text{In } k = \frac{E_a}{RT} + In\,k$$

The plot of In k vs l/T gives a straight line according to the equation. Thus, it has been found from Arrhenius equation that increasing the temperature or decreasing the activation energy will result in an increase in the rate of the reaction and an exponential increase in the rate constant.

$$\text{In graph, slope} = \frac{-E_a}{R}$$

Q3)

7. Consider the Arrhenius equation given below and mark the correct option.

$$k = A\, e^{-E_a / RT}$$

(i) Rate constant increases exponentially with increasing activation energy and decreasing temperature.

(ii) Rate constant decreases exponentially with increasing activation energy and decreasing temperature.

(iii) Rate constant increases exponentially with decreasing activation energy and decreasing temperature.

(iv) Rate constant increases exponentially with decreasing activation energy and increasing temperature.

ANSWER : (**iv**)

Q4)

11. Which of the following statements is correct?

(i) The rate of a reaction decreases with passage of time as the concentration of reactants decreases.

(ii) The rate of a reaction is same at any time during the reaction.

(iii) The rate of a reaction is independent of temperature change.

(iv) The rate of a reaction decreases with increase in concentration of reactant(s).

Ans. (i)

Explanation: The rate of a reaction can be defined as the change in concentration of a reactant of product in unit time. To be more specific, it can be expressed in term of:

(i) The rate of decrease in concentration of any one of the reactants, or

(ii) The rate of increase in concentration of any one of the products.

Concentration of reactant decreases with the passage of time, we can say that the rate is also decreasing. $r = -dx / dt\ (r = rate)$