

QUESTION

75. For a complex reaction $A \xrightarrow{k} \text{products}$

$$E_{a_1} = 180 \text{ kJ/mol}; E_{a_2} = 80 \text{ kJ/mol}; E_{a_3} = 50 \text{ kJ/mol}$$

Overall rate constant k is related to individual rate constant by the equation $k = \left(\frac{k_1 \cdot k_2}{k_3} \right)^{2/3}$.

Activation energy (kJ/mol) for the overall reaction is :

- (a) 100 (b) 43.44 (c) 150 (d) 140

ANSWER :

$$\begin{aligned} 75. \text{ (d) } k &= \left(\frac{k_1 \cdot k_2}{k_3} \right)^{2/3} ; E = \frac{2}{3} [E_{a_1} + E_{a_2} - E_{a_3}] \\ &\Rightarrow \frac{2}{3} [180 + 80 - 50] = 140 \text{ kJ/mol} \end{aligned}$$