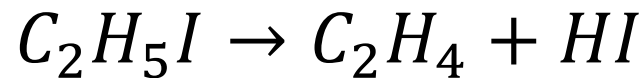


# Activation energy

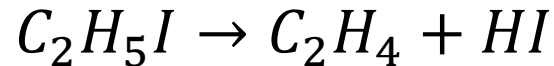
The decomposition of ethyl iodide was measured at elevated temperature. For the reaction



At 600 K the rate constant was measured to be  $1.6 \times 10^{-5} \text{ s}^{-1}$  and at 700 K the rate constant was found to be  $6.36 \times 10^{-3} \text{ s}^{-1}$ . Determine the activation energy and prefactor.

# Activation energy

The decomposition of ethyl iodide was measured at elevated temperature. For the reaction



At 600 K,  $k = 1.6 \times 10^{-5} \text{ s}^{-1}$

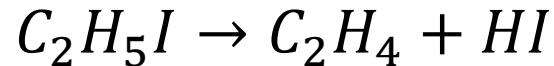
At 700 K  $k = 6.36 \times 10^{-3} \text{ s}^{-1}$

Solution: To calculate  $E_a$  use the equation

$$E_a = \frac{-R \ln \frac{k_2}{k_1}}{\left(\frac{1}{T_2} - \frac{1}{T_1}\right)}$$

# Activation energy

The decomposition of ethyl iodide was measured at elevated temperature. For the reaction



At 600 K,  $k = 1.6 \times 10^{-5} \text{ s}^{-1}$

At 700 K  $k = 6.36 \times 10^{-3} \text{ s}^{-1}$

Solution: Use the equation

$$E_a = \frac{-8.31 \ln \frac{6.36 \times 10^{-3}}{1.6 \times 10^{-5}}}{\left(\frac{1}{700} - \frac{1}{600}\right)} = 209,000 \text{ J/mol}$$

# Activation energy

Solution: We can obtain the prefactor from the Arrhenius equation

$$k = A \exp\{-E_a/RT\}$$

Therefore,

$$A = \frac{k}{\exp\{-E_a/RT\}}$$

$$A = \frac{1.6 \times 10^{-5}}{\exp\{-209000/(8.31)(600)\}}$$

$$A = 2.56 \times 10^{13} \text{ s}^{-1}$$