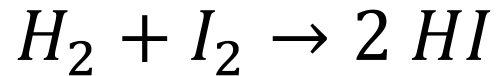


Activation energy

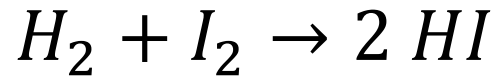
Calculate the activation energy for the reaction



given that the specific rate constant for reaction is $4.3 \times 10^{-7} \text{ M}^{-1}\text{s}^{-1}$ at 500 K and $6.3 \times 10^{-4} \text{ M}^{-1}\text{s}^{-1}$ at 700 K. Calculate the rate constant at 600 K.

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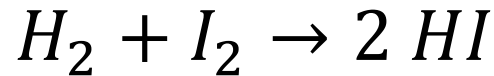
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Solution: To calculate E_a use the equation

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

Activation energy

Calculate the activation energy for the reaction



given that the specific rate constant for reaction is $4.3 \times 10^{-7} \text{ M}^{-1}\text{s}^{-1}$ at 500 K and $6.3 \times 10^{-4} \text{ M}^{-1}\text{s}^{-1}$ at 700 K. Calculate the rate constant at 600 K.

Solution: Use the equation

$$E_a = \frac{-8.31 \ln \frac{6.3 \times 10^{-4}}{4.3 \times 10^{-7}}}{\left(\frac{1}{700} - \frac{1}{500}\right)} = 106,000 \text{ J/mol}$$

Activation energy

Solution: We can obtain the prefactor from the Arrhenius equation

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

Therefore,

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

$$A = \frac{4.3 \times 10^{-7}}{\exp\{-106000/(8.31)(500)\}}$$

$$A = 51,600 \text{ s}^{-1}$$