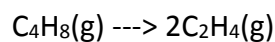


## Answer on the question #55936 - Chemistry - General chemistry

### Question:

The following reaction has an activation energy of 262 kJ/mol.



At 600.0 K the rate constant is  $6.1 \cdot 10^{-8} \text{ s}^{-1}$ . What is the value of the rate constant at 750.0 K?

### Solution:

According to Arrhenius' law, the rate constant is dependent on the activation energy and temperature as follows:

$$k = Ae^{-\frac{E_a}{RT}}$$

Then, the rate constants ratio at different temperature will be:

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

Let's say  $k_1$  is the rate constant at 750 K and  $k_2$  is the rate constant at 600 K.  $E_a$  is the activation energy,  $6.1 \cdot 10^{-8} \text{ s}^{-1}$  hence:

$$k_1 = k_2 e^{-\frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)} = 6.1 \cdot 10^{-8} \cdot e^{-\frac{262 \cdot 10^3}{8.314}\left(\frac{1}{750} - \frac{1}{600}\right)} = 2.2 \cdot 10^{-3} \text{ s}^{-1}$$

**Answer:**  $2.2 \cdot 10^{-3} \text{ s}^{-1}$